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DOMESTIC SOAP MAKING.

BY HERBERT CLARK.

AN old adage tells us that "a penny saved is as good as a penny gained." Sometimes, however, the cost of saving the penny runs away with the profit, and occasionally the passion for "saving" takes so firm a hold on its victim that—in the very expressive, if somewhat figurative, language of an old landlady of the writer's—the said victim of overstrained economy does not hesitate to "skin a flint for a halfpenny and spoil a fourpenny knife on the job." Domestic soap making is not open to such an objection, and, if carried out on the lines herein laid down, will be found a "game" well "worth the candle."

The profitable utilisation of otherwise waste material has laid the foundation of many a fortune, but, generally, the "waste" requires to be dealt with in large quantities. For instance, the rags produced in any one household taken alone are almost valueless, but when the rags of a nation are collected and suitably dealt with, they are found to yield profitable employment to considerable numbers in our manufacturing centres, and to contribute very materially to the cheapening of clothing, etc. But soap, as no doubt all my readers are aware, is not made of rags, but fat, etc., the "etc." being oftentimes the most important shareholder in the concern. Fat, nevertheless, *is* used, and fat, in greater or less quantity, is a waste material in many households, and differs from rags in this respect among others—that there is seldom, if ever, any market for it; and though candles as well as soap are made from fat, very few would care to engage in the domestic manufacture of candles, which, in most cases, would prove a greater nuisance than the raw material from which they were made.

Until somewhat recently, the domestic manufacture of soap must have been looked upon as a very troublesome, if not costly, "economy," on account, principally, of the prolonged boiling to which the fat and alkali had to be subjected in order to bring about their conversion into soap. This drawback has been overcome by the introduction by the Greenbank Alkali Works Co., of St. Helen's, Lancashire, of a highly concentrated caustic soda, known as "98 per cent. caustic soda," which is supplied in packages adapted to the requirements of the domestic soap maker. The writer has had some practical experience in this connection, and can confidently recommend such of the readers of WORK as may be so disposed to give the process described in this article a trial. As an inducement to make such a trial, it may be mentioned that the process is at once simple, effective, and cheap; at the same time it secures several important advantages, such as purity and the retention of the glycerine. This latter is evidently a very important point, for, in the ordinary "boiling" process, the glycerine, which is a bye-product of the process, and well known and valued as an emollient, is lost to the consumer of the soap.

The materials required consist, as already stated, of fat and alkali.

The necessary apparatus consists of a vessel for melting and purifying the fat, a vessel for dissolving the alkali, a vessel in which to mix the fat and the alkali, a thermometer, a stirrer, and a rectangular box in which to mature the soap.

Any fat may be used so long as it is *free from salt*—this condition is absolutely essential to success. The alkali may be obtained in ten-pound tins, direct from the Greenbank Alkali Works Co., at five shillings and sixpence per tin; it may also be obtained from

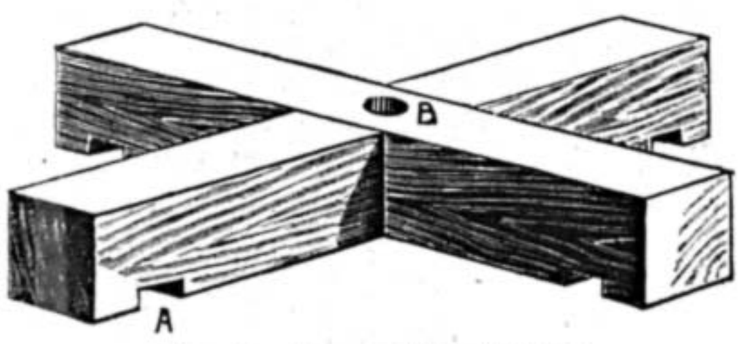

Fig. 5.—Support for Stirrer.

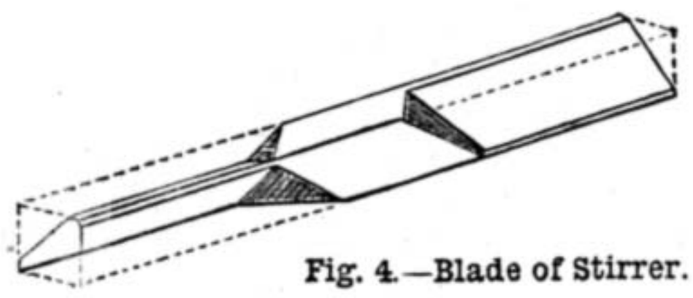

Fig. 4.—Blade of Stirrer.

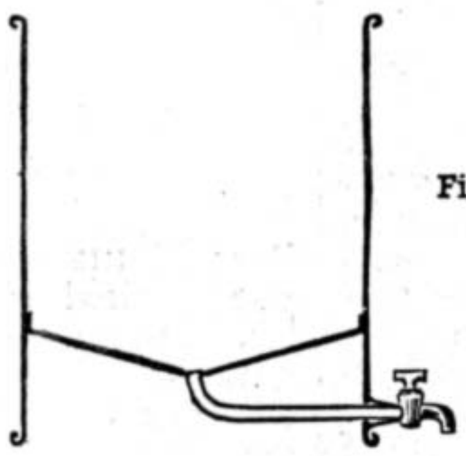

Fig. 1.—Ley Tank.

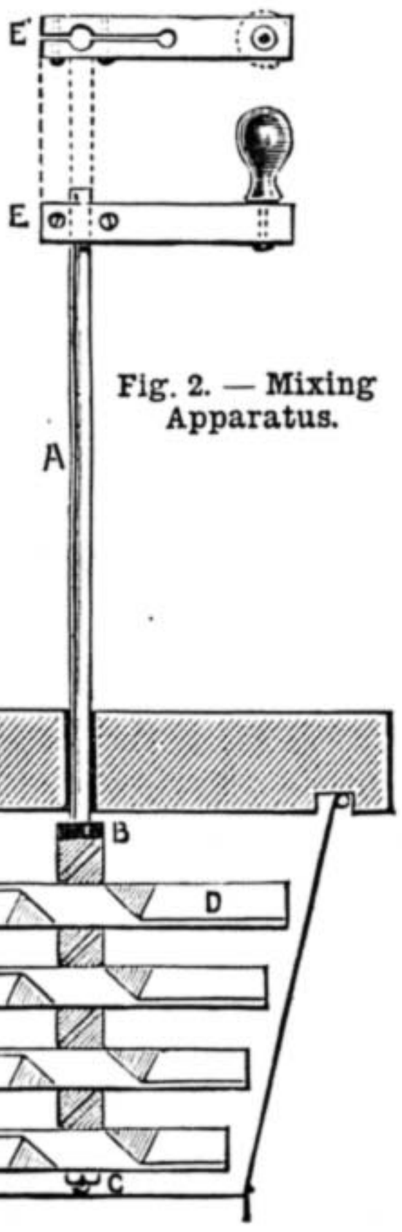

Fig. 2.—Mixing Apparatus.

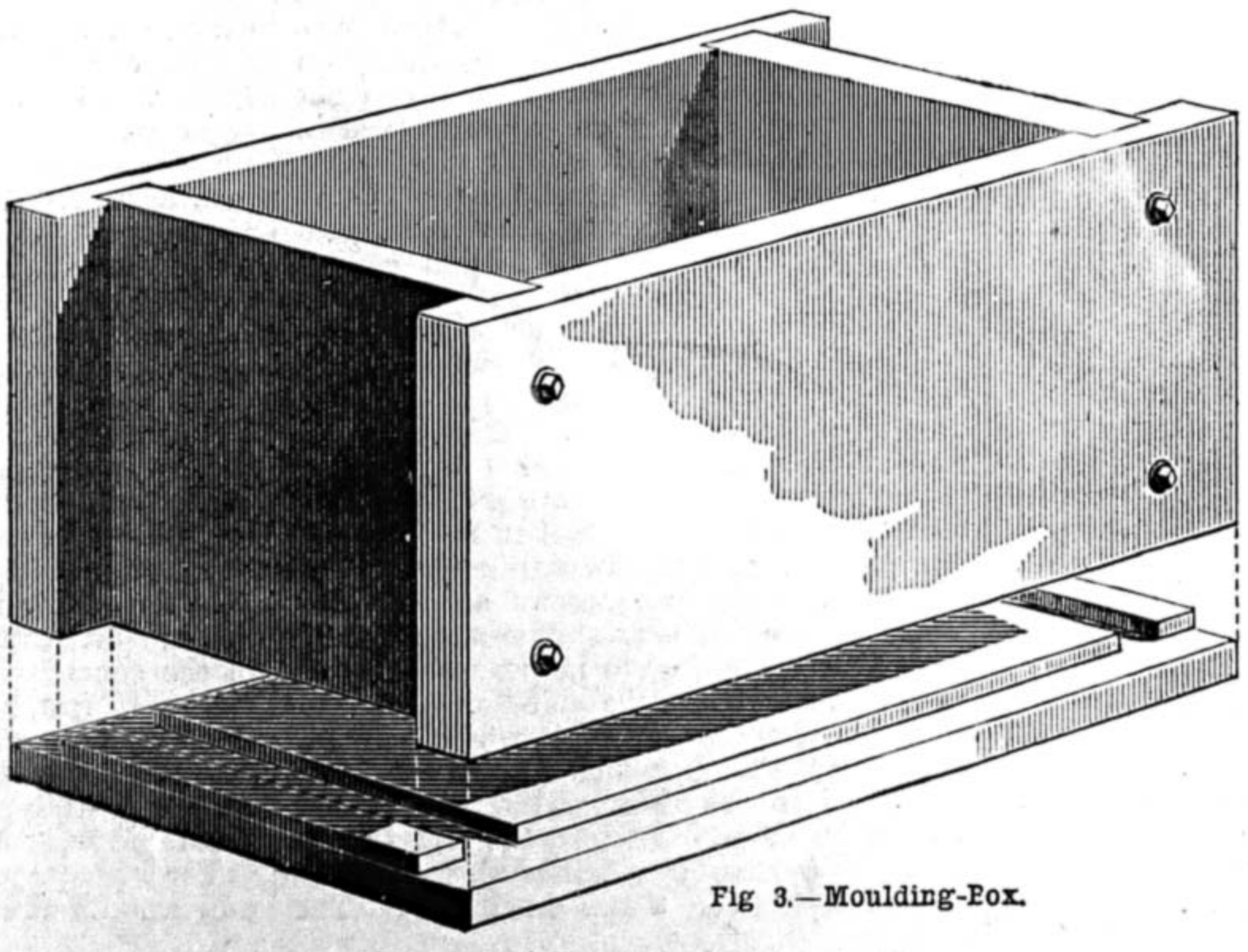

Fig 3.—Moulding-Box.

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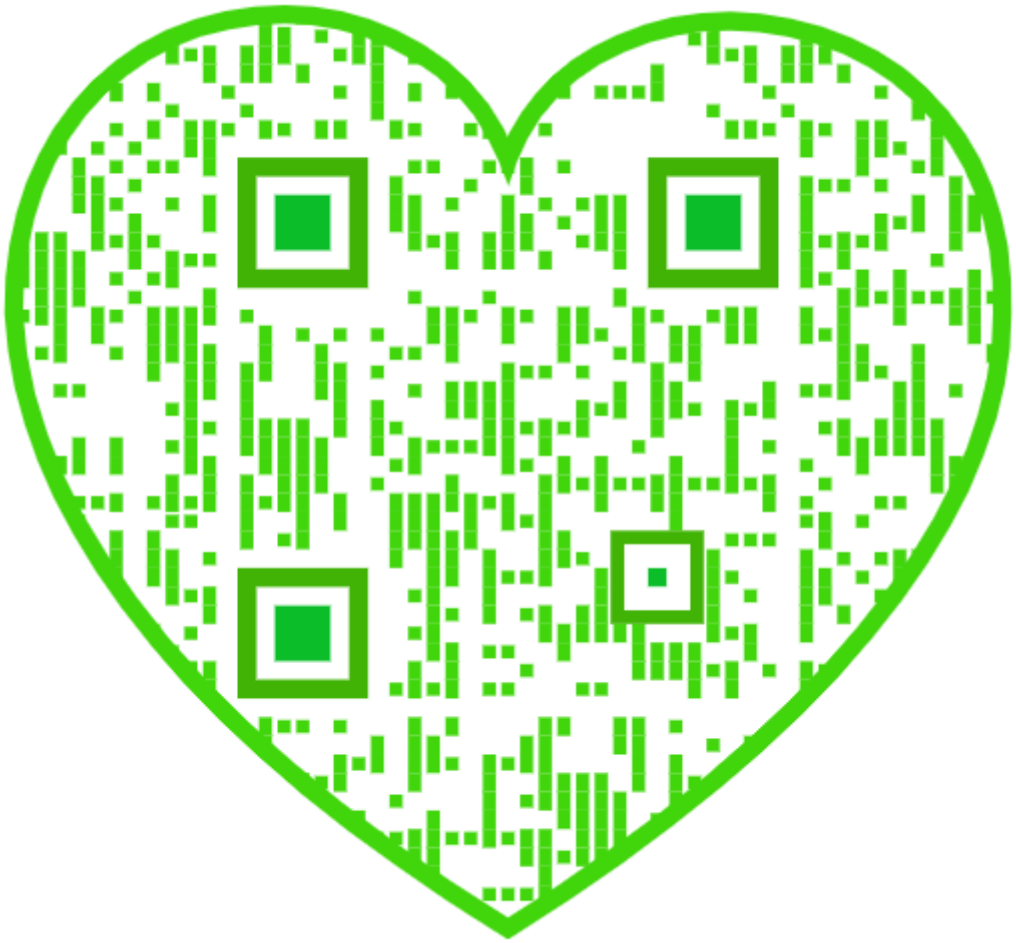

most respectable oilmen and druggists in sixpenny tins, containing half a pound each. A half-pound tin is sufficient for three pounds of fat, but seventy pounds of fat may be converted into soap by means of the contents of a ten-pound tin.

A large kitchen saucepan will do very well for the purpose of purifying the fat, and a large earthenware jug cannot well be beaten as a container for the alkali solution; a common galvanised pail may be conveniently used as a mixing vessel; a bath thermometer, with its wood case removed, will be found "just the thing," since it will float upright in either the melted fat or the alkali solution; and a stirrer, shaped like a cricket bat, may be quickly formed out of any bit of flat board which may be at hand. Any common box of a suitable size, lined immediately before use with wet calico, will answer admirably for a mould.

As it is perhaps best that at the first attempt only a small quantity of materials should be operated on, we will assume that it is intended to saponify only three pounds of fat, for which purpose a half-pound tin of alkali will be required.

Having materials and apparatus in readiness, we commence operations by preparing the "ley"—that is, the solution of alkali. To do this we carefully measure one and a half pints of water and dissolve the half-pound of alkali therein. The alkali will dissolve very readily, and the solution will become quite hot. This must be left to cool while we prepare the fat. If any doubt exists as to the purity of the fat and its freedom from salt, it should be melted and thoroughly agitated with boiling water, and after allowing sufficient time for the fat to rise to the surface, the water should be drawn off by means of a syphon made of a piece of glass or lead tubing, after which the liquid may be again agitated with hot water and allowed to settle as before. This time the fat should be drawn off into the mixing vessel.

The temperature of both fat and "ley" should now be observed, and, if necessary, regulated so that the ley stands at about 80° and the fat at about 110° to 120° Fahrenheit, according as it is of a "soft" or "hard" description. The temperatures given may be regarded as standards, from which, however, slight departures may be permitted without detriment to the result; for example, the ley may have cooled to 75° F. before the fat has been got ready; in this case we may work our fat as high as 125° F., our object being to secure an average temperature of 95° to 100° F. All being in readiness for the mixing, we take the jug of ley in the left hand and the stirrer in the right hand, and very carefully pour the ley into the fat in a small continuous stream, stirring all the while, so that no unmixed ley may reach the bottom of the mixing vessel. This is the critical part of the operation, as if any unmixed ley reaches the bottom of the mixing vessel, it will be found impracticable to secure its admixture with the fat afterwards. With ordinary care, no difficulty will arise. When the mixing is complete, the mixture must be poured into the moulding-box, previously lined with wet calico to prevent the soap sticking to the wood. The box of soap should then be well wrapped in an old blanket or rug and put in a warm place for twenty-four hours, when the box will be found to contain nearly six pounds of hard soap of excellent quality. The block of soap may be cut into bars by means of a wire or knife, and allowed to dry in a current of air for two or three weeks, by which the quality will be further improved.

The soapmaker will now, in all probability, be encouraged to follow the example of the writer, and operate on larger quantities. Those inclined to do this are recommended to procure a ten-pound tin of the caustic alkali, and, after putting one-half the contents aside in an air-tight vessel, such as a large glass bottle, for future use, dissolve the remaining five pounds in exactly two gallons of water, to form the required ley. Thirty-five pounds of fat or tallow will be required in this case, and to provide this, our domestic supply may be supplemented by waste fat, to be purchased at a low rate from the family butcher. This, being free from salt, will only need to be melted and strained from the "greaves," which will form an acceptable meal for the watch-dog.

The simple apparatus already described will do in this case also, but it will be found convenient to provide a few special pieces of apparatus, as illustrated by the accompanying drawings, namely, a ley tank fitted with a tap (Fig. 1), a stirrer (Fig. 2), and a moulding-box (Fig. 3). The writer strongly advises the use of a stirrer constructed as herein described, even if all the rest of the apparatus used be of the "makeshift" type.

The vessel (Fig. 1) should hold about six pints. Its bottom is made to fall towards the centre so that it may completely empty itself, and is fitted with a tap so that it may be regulated to deliver the ley evenly and at the requisite speed with the least possible attention. It may be made of tin.

The construction of the stirrer will be readily understood by reference to Fig. 2, in which it is shown standing in a pail ready for use. The spindle, A, may be made of a piece of $\frac{1}{8}$ in. iron gas-pipe about 2 ft. long, having a "collar" brazed or soldered on at B, $8\frac{1}{2}$ in. from the bottom, where it is screwed and fitted with a nut, C. The blades, D, of which there are eight, are formed of strips of wood 1 in. square in the manner shown in Fig. 4, in which the dotted lines indicate the original square shape of the strip, and the solid lines the shape of the finished blade. A hole is bored through the centre of each blade to suit the spindle, A. These blades are graduated in length to suit their respective positions in the particular pail in which they are to be used, and which should be of not less than two-gallons capacity. Each blade should clear the side of the pail when in use by not more than $\frac{1}{2}$ in. When all the blades have been prepared, they should be placed on the spindle and alternately set at right angles; they should then be firmly fixed in this position by the screw-nut, C. A cross is now made of $2\frac{1}{2}$ in. wood, as shown in Fig. 5, and provided with notches, A, adapted to the pail, and furnished with a central hole, B, through which the spindle of the stirrer will pass freely, but without much "shake." The stirrer is fitted with a crank handle, E, which is attached to the spindle, as shown in plan at E'. This crank is formed of a piece of wood 1 in. square, through which two holes are drilled to suit the spindle; a saw-cut is then run from E' down the centre of the wood into the farthest hole, as shown; two screws are then inserted from the side, as shown, and by their means the crank, when in position, can be securely fastened to the spindle. The construction of the moulding-box is clearly indicated in Fig. 3, which shows the ends grooved into the sides and the sides and ends together grooved into the bottom, the whole being held together by "coach" screws $2\frac{1}{2}$ in. or 3 in. in length. The internal dimensions are 15 in. long, 10 in. wide, and 12 in. deep, and the whole may be made of $1\frac{1}{4}$ in. or $1\frac{1}{2}$ in. wood.

Our large mixing should be proceeded with thus:—*Weigh* out $8\frac{1}{4}$ lbs. of ley, and place it in the tank; weigh also $11\frac{1}{4}$ lbs. of the melted fat, and place it in the mixing pail. Place the stirrer in position, and set the ley tank so that on opening the tap the ley will flow into the pail. Set the tap so as to deliver a stream about the thickness of a thin penholder, and *immediately* commence turning the stirrer at a moderate speed in the direction of the motion of the hands of a watch. As the stirrer is revolved, the blades, owing to their peculiar shape, will constantly lift the materials from the bottom towards the top of the pail, thus counteracting the tendency of the ley to fall to the bottom, and securing a very perfect admixture of the whole mass. When the first portion has been mixed, empty it into the moulding-box, and proceed to treat another portion in a similar manner. Weighing may be dispensed with at the third and last mixing, unless waste of some portion of the materials has been incurred. Should this, unfortunately, have been the case, care must be taken to use the proper proportions of fat and ley—viz., 7 lbs. of fat to 5 lbs. of ley, and so on.

Memoranda.—Hard wood, such as beech or birch, to be used for all apparatus.

Dry alkali and ley to be carefully kept from contact with flesh and clothing.

Fat to be weighed *when ready for use.*

Stirring not to be continued longer than necessary to secure perfect mixing, or *separation* will commence.

Soap may be *scented*, if desired, by the addition of any approved perfume to the fat just before mixing.

The mixture to be kept as warm as possible for at least twenty-four hours.

TOWN ROADWAYS: THEIR CONSTRUCTION AND MAINTENANCE.

BY J. CHARLES KING.

ROAD-MAKING was an art well understood and practised by the Romans in this country. The roads of that early epoch, by their remains, testify to their substantial and enduring character, and obviously served the purpose intended: to resist the wear of cattle, horses, and wheeled vehicles in traffic, which was doubtless heavy for stone and timber. As an art, road-making does not seem to be understood by modern road surveyors and contractors; while of workmen as road-makers, it may be said they are animated beings, used to obey the orders of Vestries and Councils, whether the orders are flagrantly wrong or not.

The macadam and granite block orders of roadways are found to create so much mud and noise in towns and cities, that substitutes are sought in other materials free from these objections.

The two chief substitutes in general use in London, and other cities of the United Kingdom, are wood and asphalte. These yield a clean and quiet pavement for wheeled traffic, but from defective arrangements in the concrete foundation on which these materials rest, the roadways of wood and asphalte fail, rapidly yielding *beneath* the concrete under heavy-weighted traffic, producing a "billowy" surface to the roads and rapid wear in the hollow places.

For asphalte when newly laid, why sleek and smooth the surface to a bright polish

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as is done? Roll the still warm and soft surface with a diamond-ridged roller: that would impart a network of fine channels to the surface, and ensure a better foothold for horses, without harming the serviceable character of asphalte as a pavement.

Another evil is the too smooth surface of the roads for the grip of horses' feet on wood and asphalte, when they become slimy by watering, or by rainfall mingled with dirt which accumulates on them. That it is a costly paving is admitted; ratepayers pay heavy road rates, and injuries to horses and vehicles by horse owners' losses show that these pavements are *made not* to fulfil the purposes for which they are both so admirably adapted. I say "made not to fulfil" deliberately, because contractors, road surveyors, and parish authorities, through ignorance of or indifference to the simplest facts in mechanics—or worse motives—make bad roads, with surfaces that cause frightful injuries to horses by their falling heavily with loads, or by strains in slipping, when such need not occur if the surfaces are adapted to take the grip of the horses' feet. Thus, Fleet Street, London, E.C., to wit. How are these bad roads made? The foundation of a road, however hard it may be—when wood or asphalte is to be laid—is broken up, not to a uniform depth, but at haphazard, at *varying depths*, and *without rammings;* this loosened surface is smoothed level, and concrete laid over it as a bedding for the wood or asphalte. Under heavy or continuous traffic, this crust of concrete becomes broken down where the substratum of loose ground was loosest, with the result that the superincumbent roadway sinks with the substratum. To obviate this settlement, some of the roads are made at great cost with greater depth of concrete—to be broken up at great cost—and the substratum loosened every time the road is paved with wood or asphalte. Having shown how the foundation of roads is made bad, the obvious remedy is *not to do it*, but to thoroughly ram the substratum on which the concrete is to rest, so as to make it level and solid.

Now, as to slippery surfaces. The same display of official ignorance of the simplest laws of mechanics prevails both for wood and asphalte surfaces.

The wood blocks are laid variously as to joints, some close, some about $\frac{3}{8}$ in. apart at side joints. In Fleet Street, close, where they should be wide open. How are these joints filled? Variously. In some cases tar is swept in, as in Fleet Street; in some liquid lime; in some river-drift is used. These mostly serve to top-surface all wood pavements.

These substances, by being worked up with water, become slimy slush. The joints which should form a check to slipping are unavailing for that purpose if close, hence the numerous accidents to horses and vehicles; and if jointed with slime and mortar are always greasy.

As the slimy sludge is the cause of slipping, keep it off the pavements made of wood, and substitute a simple effective gripping material in every side and end-joint of the wood blocks forming the pavements.

Make every joint not less than $\frac{5}{8}$ in. apart. Have the wood blocks tarred and the tar quite dry before laying the blocks in place, then ram broken granite, not less in size than $\frac{1}{2}$ in. polygons, into each joint, *without lime* or river-drift. Pass a steam roller over this surface, and see that the granite "keying" of the wood is well up to the surface, to give a bite to the iron shoe of the horse. As it becomes solidified, it would form a ridge of granite, which as it wore would aid to roughen the surface of the wood pavement.

The difference in length of a block of deal (of which wood pavements are generally made), under the influence of the atmosphere, wet or dry, is about $\frac{1}{4}$ of an inch; on a 50 feet wide roadway the expansion of wood, when wet, is over 12 inches: here is the hydraulic pressure which lifts up the side walks which are on each side of such a road surface. The effect is various, according to the lay of the road and the fulcrum bearing of the blocks on the curb-edge of the pavements.

The expansion of the wood in most cases lifts the curbing and paving-stones up at the points of contact, making the contiguous pavement beyond, which is undisturbed, lower than the curbing, and causing rain to settle there in shallow pools, as in the front of the new Law Courts and other parts of the Strand, Fleet Street, and the main streets of the City of London.

Sometimes the roadway itself is lifted up, and the novel sight of "wooden billows," as the boys call them, are formed; the vehicles, depressing them in one part, causing them to rise in another part of the road. This

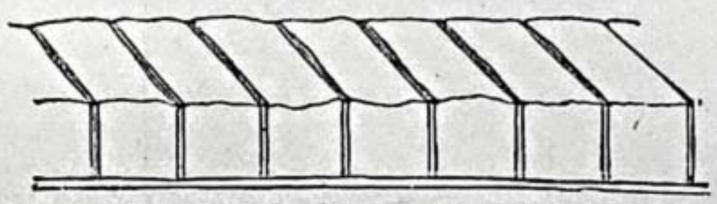

Fig. 1.—Section of Roadway with Blocks worn.

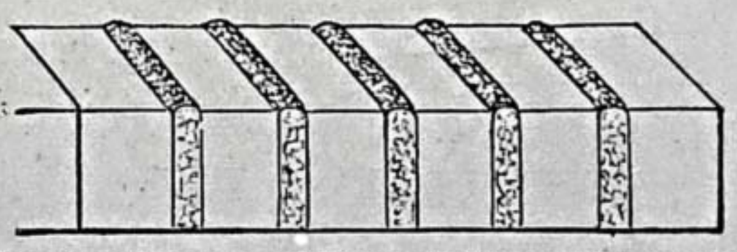

Fig. 2.—Section of Wood Paving with Joints packed with Coarse Polygon Granite.

occurs in patches of 8 or 10 feet in length by 4 or 5 feet in width.

The 'busmen and carters call these roads "parish jobs," and will tell you the same things have been going on for twenty years.

Fig. 1 exhibits a section of a roadway which shows how the wood blocks are when worn out—*i.e.*, one-third of their depth only.

The tar which was swept on to the surface finds its way partially down the sides of the blocks. It does not preserve them, cement them together, or serve any purpose but to make black slime when mixed with mud. The mortar-wash that is swept on has the same effect; and the sand, which is thrown on last, finds its way only into the upper part of each joint, and soon becomes useless as grit for the grip of horse-shoes.

An experiment was tried of having the wood blocks about $1\frac{1}{2}$ in. apart, but not having suitable grit between the blocks to fill the joints, they became simply mud-gutters, and had to be cleaned out to prevent the horses from slipping when hauling heavy loads.

On some of the slight inclines in the City channels are V-adzed in the joints: these channels hold mud and cause slipping, with the added objection that it mars the effect of a level surface of wood, it being made bumpy, and producing a rumbling noise upon the passage of vehicles over it. Fig. 2, a sketch showing a section of wood paving with coarse polygon granite, will illustrate the simple efficacy of such form of joint-packing to prevent slipping and allow for hydraulic pressure of expanding blocks in wet weather, as the stone polygon becomes pressed into the soft-yielding wood surfaces.

The use of soft deal for heavy traffic is objectionable because of its rapid wear. In the west of London hard red-wood is used, and no doubt is far superior to deal.

Road-making seems at present to be a means of levying rates which Vestries and Boards of Works will not relinquish into capable hands. This is an item of cost which goes far to make up the £300,000,000 indebtedness of parochial and municipal authorities of England, Scotland, and Wales.

HIVES AND OTHER APIARIAN APPLIANCES.

BY APIS.

BENNETT'S SELF-HIVER—ALLEY'S SELF-HIVER—QUEEN CAGES—DRIVING IRONS—BINGHAM UNCAPPING KNIFE—WINTER PASSAGE CUTTER—TRANSFERRING RACK—CONCLUSION.

WHAT a happy mind a bee-keeper would have if he could be certain that none of his swarms would escape; if he knew that when his hives swarmed the new stocks would of themselves find out comfortable quarters prepared and made ready for their reception; if, in short, he had a self-hiver!

Such an arrangement has been invented by Mr. R. Bennett, of Halesworth; and although in practice it has not come up to the expectations of the most sanguine, yet it is decidedly a very useful apparatus. Fig. 1 will show its general appearance, and its position with reference to the hives.

It must be understood that one of the hives shown contains the stock of bees which is expected to swarm, while the other is the empty hives containing frames, foundation, quilts, and possibly comb and honey, into which it is desired to lead the swarm.

I may be permitted to quote Mr. Bennett's own words, as they very clearly describe how it can be made:—

"First, get a thin board of $\frac{1}{2}$ in. stuff, 2 feet long and 6 in. wide (any size can be adopted at the discretion of the maker); next a piece of queen excluder zinc, same length as the board, and 9 in. wide; bend $1\frac{3}{4}$ in. on each side, along the whole length of the zinc, and tack the bottoms of the bent sides along the edges of the board; then nail along each of these sides a thin strip of wood $\frac{3}{4}$ in. wide, and you have a sort of square tunnel—2 feet long, 6 in. wide, and $1\frac{1}{4}$ in. deep, with both ends open, and a sort of miniature alighting board along its sides. Place an empty hive in front of the one expected to swarm, draw apart the slides to form an entrance 6 in. wide, and put the above cage or tunnel on the entrance board of each hive, the open ends of the cage being in front of the entrances of both hives, and the thing is complete."

With regard to the practical working of the self-hiver, one gentleman reports that it did famously, the swarms settling down quietly in their new homes. In another case the swarm went off, leaving the queen in the tunnel vainly trying to follow. When she found that she could not leave, she returned to the parent hive, and the swarm joined her there.

When the same swarm issued again, and the queen tried to get through the excluder

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zinc, the owner removed the empty hive and tunnel, and stopped up the open end of the latter with paper, so that the queen had perforce to enter the empty hive. The swarm soon joined her there, and took to their new quarters readily. I mention these cases as hints and encouragements to would-be manufacturers. I have not been able to try the plan myself, as there were no swarms this year among my bees, and the thing is quite new.

Alley's self-hiver is on the same principle, the only difference being that the tunnel leads to another hive at the side of the swarming one, instead of in front. It does not promise, however, as well as Bennett's, there being so many corners and angles in it; moreover, it is patented, and its manufacture might bring a person within the clutches of the law.

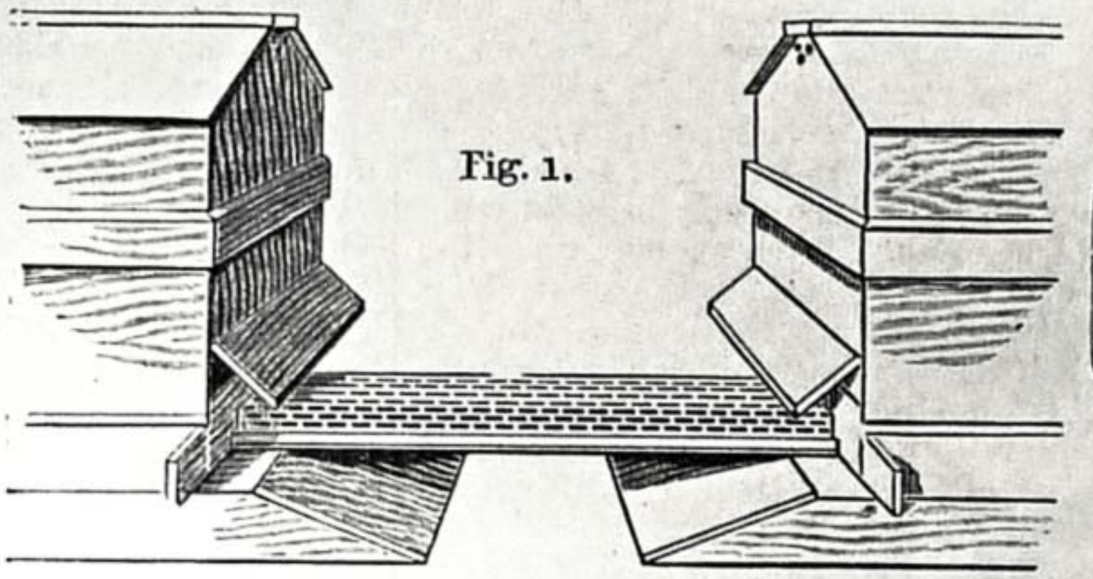

Fig. 1.

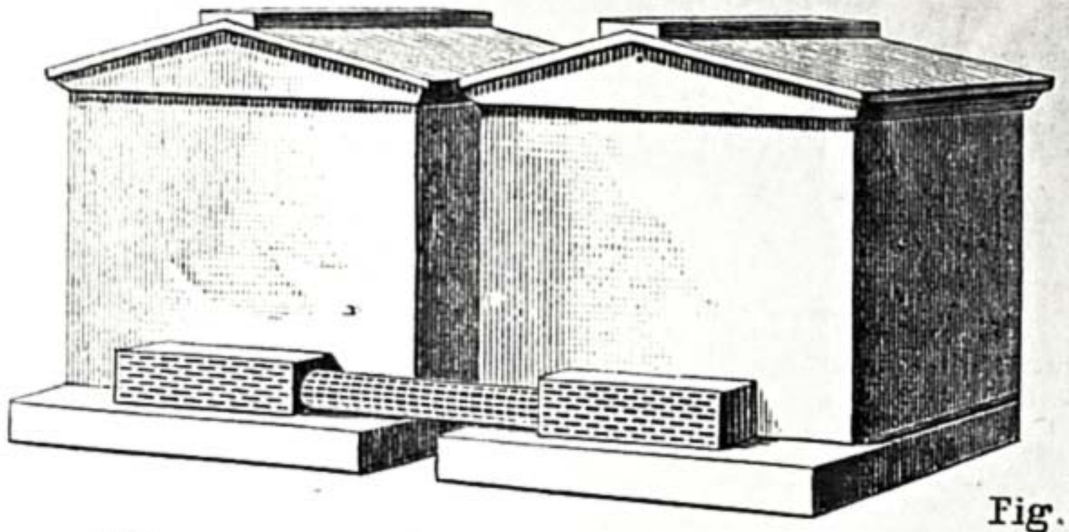

Fig. 2.

Queen cages are a necessity; the simplest of them is, perhaps, the pipe-cover queen cage, shown at Fig. 3. It can be manufactured as follows:—Get a strip of tin 6½ in. long and 1 in. wide; make it into a ring and solder the ends together; then procure a circular piece of wire gauze or perforated tin, 2 in. in diameter, and solder it on as a top, and the cage is complete. A disadvantage in this cage is that the bees must be disturbed in releasing the queen. This is overcome in the cage shown at Fig. 4. It consists of a rectangular cage, formed of perforated tin or wire gauze. Its dimensions are: Length, 4 or 5 in.; width, 1¼ in.; thickness, ½ in. A piece of stuff 3¾ in., and as long as the cage, bent over a piece of wood 1¼ in. by ½ in., will just make it. A flange is then made of plain tin for the top. This may be about 2½ in. by 1½ in., having a hole 1¼ in. by ½ in. in its centre, into which the cage fits, and is soldered, leaving a little bit projecting at the back, which is turned over a pin and acts as a hinge for the top door. This may now be made of tin 1½ in. by ⅝ in.—a hinge formed at the back by turning up the tin over a fine piece of wire or a pin, and fitted to the part of the cage projecting above the flange.

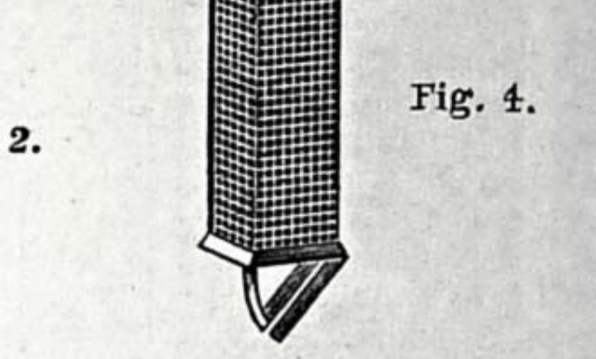

Fig. 3.

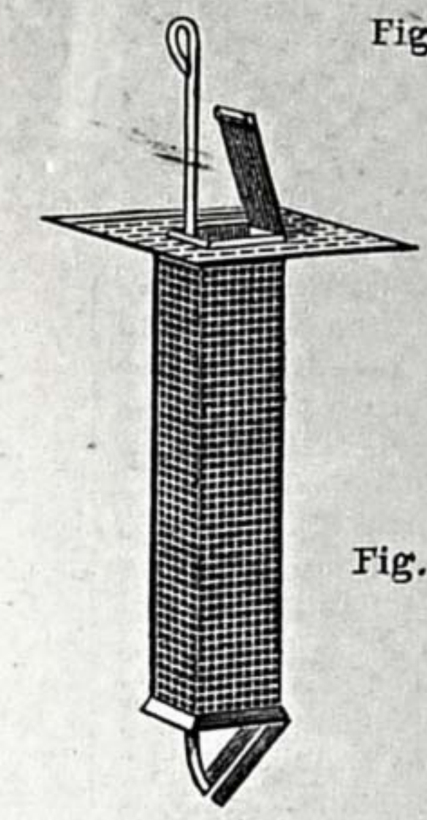

Fig. 4.

Fig. 4A.

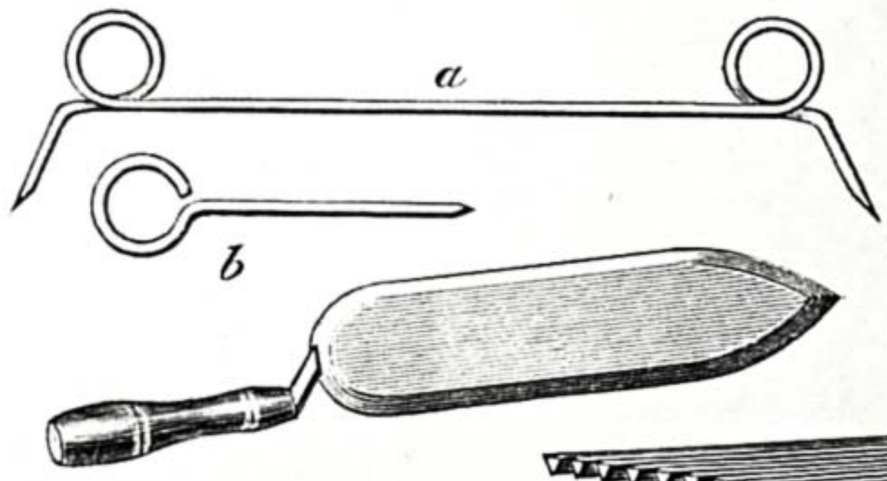

Fig. 5.

Fig. 6.

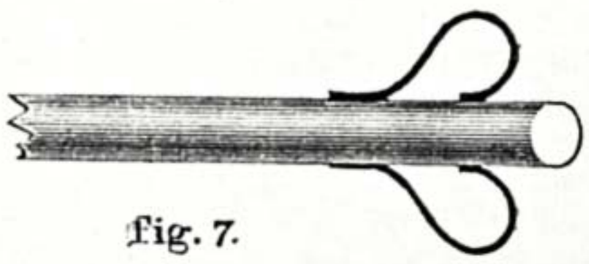

Fig. 7.

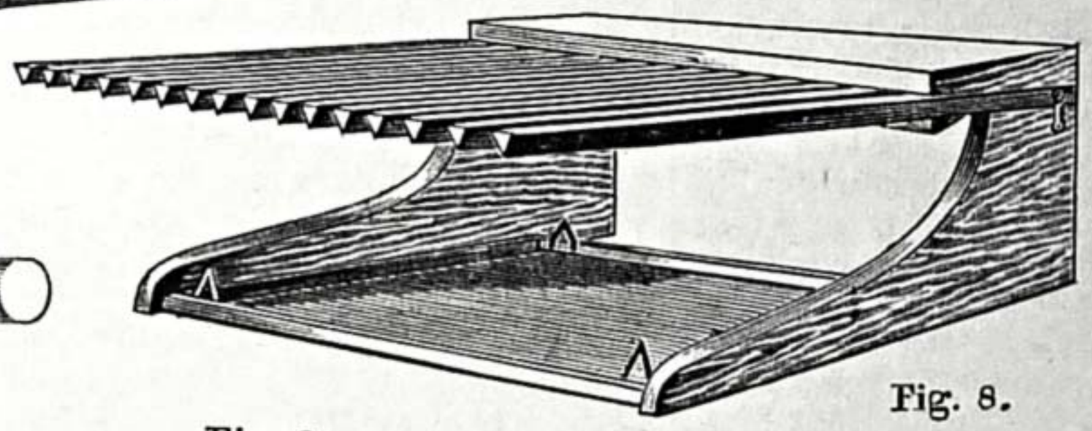

Fig. 8.

Fig. 9.

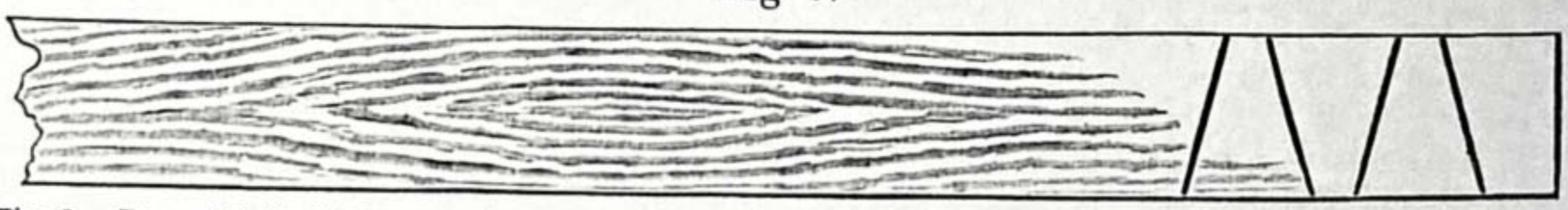

Fig. 1.—Bennett's Self-Hiver. Fig. 2.—Alley's Self-Hiver. Fig. 3.—Pipe-Cover Queen Cage. Fig. 4.—Modification of Queen Cage. Fig. 4A.—Lower Door of Fig. 4. Fig. 5.—Driving Irons. Fig. 6.—Bingham Knife. Fig. 7.—Winter Way Cutter. Fig. 8.—Cheshire Transferring Board. Fig. 9.—End View of Board, showing how Tongues may be cut.

A door for the bottom can be made of wire, bent like 4A, the two wires being ⅛ in. apart, and the distance from centre to centre of the loops being 1¼ in.—*i.e.*, from the single loop at the left to the line joining the pair of loops to the right. This door may now be fastened to the cage by passing a pin through the lower right-hand corner of the cage, so as also to pass through the two loops of the door. Some provision should be made, either by washers or a couple of twists of fine wire, to keep the door in the centre of the cage; otherwise it might move against the side, and allow the bees to have access to the imprisoned queen. A light wire hooked on to the front loop, and passing with slight friction through a hole in the flange, completes the cage. The queen is released by pressing down this wire, which projects about an inch above the flange, and ends in a loop.

Driving irons are like Fig. 5. I make a great number of sets, as they appear constantly to get lost. They are made of wire nearly ¼ in. thick; the loops in *a* are 9 in. apart, and the ends about 1½ in. long, roughly pointed with a file. About 20 in. of wire are required for *a*, and two like that and one like *b* complete a set; *b* is about 9 in. long, and the loop 2 in. diameter. It requires 15 in. of wire.

A Bingham knife (Fig. 6) is not to be undertaken, except the manufacturer has special facilities for that kind of work.

The blade is made of good saw steel, 6 or 7 in. long and from 2 to 3 in. wide, shaped to the patterns shown in the figure, and sharpened all round like a chisel, from the under side only. A tang is made of ⅜ in. iron or steel, one end being pointed to fit the handle and the other flattened so as to be easily fastened to the blade, to which it is secured by two rivets. These should be countersunk into the under side of the blade and ground flush with its surface; when the blade is laid flat on a board, the handle is raised about an inch from it, and the tang should be bent in such a manner as to secure this. The whole thing is not unlike a mason's trowel.

Fig. 7 shows an affair for cutting passages through the combs on the approach of winter. It is simply a tin cylinder about an inch in diameter and 4 or 5 in. long, having one end serrated so as to cut the comb more easily.

Towards the other end a couple of lugs of wire may be soldered, to afford a better hold to the fingers, as shown in the engraving.

A Cheshire transferring board is shown at Fig. 8. Its object is to afford facilities for transferring the combs cut from a skep to a bar-framed hive.

The table proper consists of sixteen tongues projecting from a back support about 10 in. To make it, a piece of wood about 16 in. long, 3 in. wide, and 1 in. thick should first be procured. This must now be planed quite flat and out of winding, the under surface being especially true. The tongues are next to be prepared. They can be all cut out of a piece of yellow pine 13 in. long, 1 in. thick, and about 11 in. wide. Fig. 9 is an end view of this piece of wood, showing how the tongues could be cut out. Of course, it will require care to cut the bevels to the proper angle, but any want of

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accuracy in the saw can be rectified by the trying plane. The dimensions of each tongue, when finished, will be: length, 13 in.; top width, ⅜ in.; bottom width, ¼ in.; depth, 1 in.

These tongues must now be fastened to the back piece either with nails or screws, preferably the latter, each tongue being at right angles to the back, and the edges ¼ in. apart. The spaces between the tongues immediately underneath the support of the back it would be well to fill up with pieces of wood nicely fitted in, but by many this would be neglected altogether, as being somewhat troublesome. The legs now demand attention, and these may be either fixed or folding. In any case they will be cut to the shape shown at Fig. 8, the height being 6 or 8 in.; length from front to back, 12 in.; and thickness of the wood, 1 in. If they are folding, hinges should secure them to the back support, strap or butt hinges 3 in. wide doing the business very well.

The outside surface of the legs is quite flush with the outer edge of the last tongue, and to prevent the leg shutting up when not wanted, a hook and eye, such as is used to hold the first door of a cupboard, is fitted, the hook being secured to the leg and the eye screwed into the surface of the tongue. This is shown at the right-hand side towards the back of Fig. 8.

A tin tray the complete size of the space between the legs is necessary to catch any honey which may drop from the combs during manipulation.

As this piece of apparatus will be always exposed to the smearing of honey, it would be well to give it several coats of a hard varnish, which will make the surface washable, a condition of things which the apiarist should always remember and act upon.

I have now written a fairly complete description of the various apparatus which are to be found in a well-appointed modern apiary; but I feel that there are many points which were overlooked or had to be neglected through want of space. The observatory hive, which I promised in an early chapter, and which has been asked for by some correspondents since, will have a chapter devoted to itself in the next volume, if I am permitted to write it; and my circular saw table will be treated in the same manner.

Bee-sheds, or houses, as distinct from hives, form a very interesting study; and if a demand arises for a description of some very useful and workable styles, I will be glad to supply it.

In the meantime I will bid my readers adieu, thanking them for the indulgence they have shown me, and hoping that what I have written will help many to carry on with economy and success that fascinating pursuit which all bee-keepers enjoy so much.

That bee-keeping is an employment that brings pecuniary reward with it as well as pleasure, no one can doubt or will dispute, as honey always commands a ready sale. To the clergy located in country districts it may be specially recommended as a profitable hobby well worthy their attention.

THE ART AND PRACTICE OF SCENE PAINTING.

BY WILLIAM CORBOULD.

LEAVES IN FOREGROUND—HIGH LIGHTS—DARK MARKINGS—FOREGROUND ROCKS, LARGE STONES, BROKEN GROUND, ETC.—FINAL TOUCHES.

Leaves in Foreground.—When the artist is painting the foreground and wishes to represent leaves such as the blackberry briar with its leaves sometimes beautifully variegated, let him take his flat fitch—the large one—and lay it one side in green, and then turn it over and lay the other side in lake or burnt sienna. Now let him hold the brush, hair downwards, and touch the tips of the hair in a bright colour, either orange or lemon chrome. Hold the brush up and press (not the flat side, but the edge) sideways, as shown in Fig. 2, and press it firmly against the canvas, taking it away quickly. This has to be done three times for each blackberry leaf, as the leaf is in three distinct parts, as shown in Fig. 3. It will be found that the leaf will have the different tints required and the form as well without touching it again. The brush, if well charged with colour, will do several leaves without replenishing, and they are boldly put on in a moment. If anyone were to try to do the same thing with small brushes, he might niggle at the work for an hour without success. When it is desired to represent grass, take the large foliage brush or the oval brush, dip it into two or three colours, such as green, burnt sienna, or lake, or any of the yellows. This will give the different tints required. Press the brush against the canvas firmly; in drawing the brush away, which must be done sharply, flick it upwards, and this movement will give the markings of the grass. Continue this, working downwards, but do not go over the same twice until it is dry. As the painting reaches the foreground, any large brush, filled with colours, if pressed and punched in any form against the canvas, will have a better effect than laying it flatly on. When this is all quite dry, you may glaze and scumble over it, giving the finishing boldly, using large fitches and foliage brushes for the large leaves immediately in the foreground, such as dock leaves, thistles, ferns, etc., etc. You may glaze over as often as you like with sunlight or shadow colours. By these means depth and richness are obtained, and it will be found that the finishing touches stand out well against the glazings, particularly the dark shadows under hedgerows. The different grasses, rushes, nettles, etc., will be natural when seen a little distance away, if manipulated in a proper manner; and, as I have said before, in this as in other things, earnest study will overcome all difficulty.

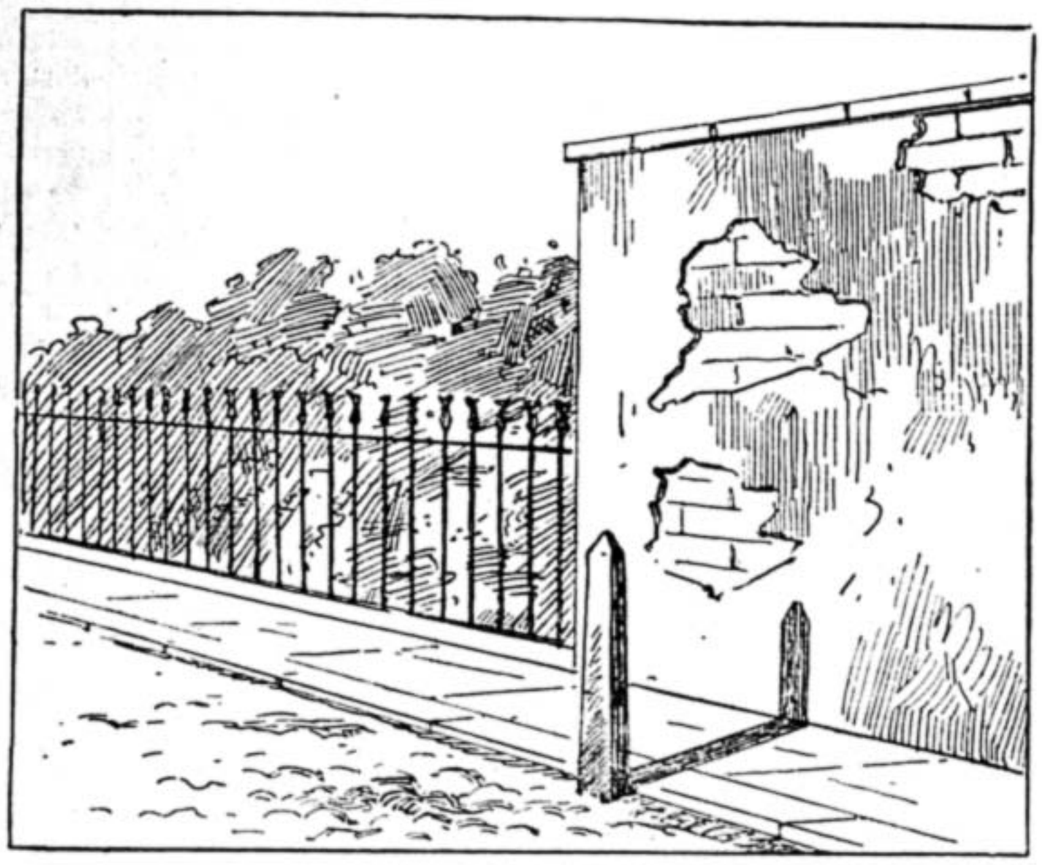

Fig. 1.—Sketch exemplifying Treatment of Shadows.

High Lights.—The last touches are the highest lights, and the colour for these must rest with the time of day the scene represents. Should it be early morning, or evening with a glorious sunset, the "high light" colours must be of the same tint as the brightest in the sky; if the scene is mid-day, with a clear sky and fleecy clouds, the high lights would be nearly white.

Dark Markings.—For the dark markings under hedgerows, bushes, etc., such as the stems and branches, use brown lake. For the blackberry briar, dip your brush in brown lake, then in azure blue; also dip in a little vermilion sometimes. In drawing the brush while forming the briar, the different tints in the brush will leave distinct markings such as are met with in Nature. These little tricky ways of getting the different effects, when mastered, lead to others which stamp the master hand, and shows each man's work as different from the other as is the handwriting of each, but may be only noticed by the connoisseur in the art.

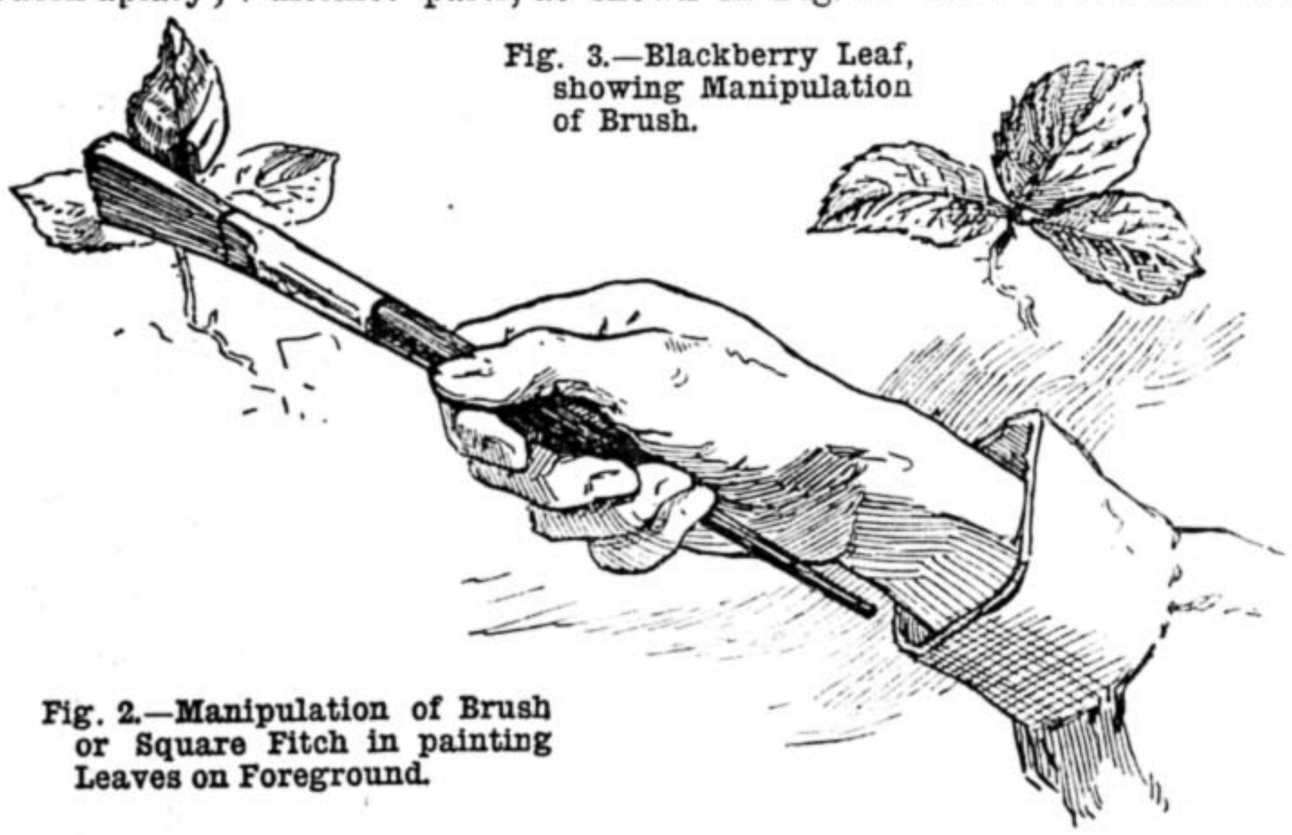

Fig. 3.—Blackberry Leaf, showing Manipulation of Brush.

Fig. 2.—Manipulation of Brush or Square Fitch in painting Leaves on Foreground.

Foreground Rocks, Large Stones, Broken Ground, etc.—Rocks and large stones in the foreground are among the most beautiful things in Nature to depict, being so varied in form and colours; some bright, others subdued by pearly greys; sometimes almost positive blue, at other times covered with green lichens, mosses, ferns ever various in tint and also in form: no two alike, sometimes rugged and angular, sometimes round and smooth; perhaps towering upwards, overhanging the path or roadway in all sorts of grotesque forms, making fine subjects for the scenic artist's skill.

In the first painting or laying in of rocks, whatever colours may be used, it would be best to have a brush for each colour. Lay the colour on anyhow, the rougher the

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better; do not work it about too much. Let the different colours join or overlap each other, but do not mix them about, or you lose transparency, the colours becoming muddy. Let the artist go to work in this way: he has his outlines drawn sharp and angular, and all colours come in at one time or another for rocks. Let him take, say, first Venetian red, and lay it on one part; then yellow ochre: these may run one into the other at their edges; or he may use brown lake in different degrees of strength. After these are dry, he may scumble or drag other colours over the ones first laid on; for instance, he may scumble yellow ochre over the brown lake, or umber if used, or brown lake over yellow ochre and Venetian red. He may now use some blue, either celestial or azure, mixed with white; scumble, drag, and lightly touch over the other colours. This will give the rocks the aged, hoary, and rough appearance of Nature. It is surprising how many tints you may discover in rocks, stones, old stone or brick walls, if you can only learn to look with the eye of an artist. Sometimes rocks will be covered with vegetation, grasses, lichens, mosses, bright bits of green and yellow, besides all the different tints in the rocks themselves. Even where they are washed by the sea, and to an ordinary person appear white, there are many tints of pearly greys, and heather stains, and other soft tints which must be thought of to make up the whole.

After the first colours have been laid in, as I have described, if the painter stands back from his work and looks at it, he will find the different tints shape themselves into irregular masses. Mark out these forms with vandyke brown as the eye guides, for, as I have said before, the hand is but the servant to the eye. Use the shadow colour to darken all the under-parts of the rocks. Where masses are piled one on the other, mark out with vandyke brown and glaze with shadow colour until sufficient depth be obtained to throw the light parts into bold relief, the high lights of course partaking according to the directions already given of the tints in the sky. The time of day and the position of the sun in the sky must combine to govern the shadows as well with respect to their length and depth. It is obvious that if the sun is high in the sky, the shadows will be short; while, on the other hand, if the sun is low in the sky, the shadows in correspondence would be long. A line drawn from the supposed position of the sun to the top of any object in the scene, continued in a straight line to the ground, will give the length of its shadow. Should the shadow of one object fall on another, as the shadow of a post, tree, bush, or a piece of rock, a large stone, etc., which might be near a wall, or some larger object, the shadow of the smaller object would be bent upwards, where it comes in contact with the larger one, as the shadow of the post on the flat pavement and upright wall in Fig. 1.

Final Touches.—By this time the scene will look pretty well finished, but there is still something to be done. Let the artist at this stage take a good look at his work, and where he thinks a shadow or a touch of bright colour, as the high light colour, would give additional brightness, put it in boldly. When finished, I hope it will be to the painter's satisfaction; if he has a fair amount of talent, he will not fail to please others as well as himself.

Remember this is only one simple lesson, but, if this be well studied, it will make all others easier. The artist gradually gets master of his colours, and is able to mix them to obtain the different tints required for the work.

The scenic artist has to depict anything and almost everything at different times, one day painting a scene may be from India, America, Australia, China, Japan, Egypt—in fact, every country in the world—and on another the beautiful and varied scenery of our own country. Then there are architectural scenes, interiors, street scenes, as well as seascapes in calm and storm, all requiring separate study and treatment. I hope to treat of all these subjects in their proper form at another time.

Change of Colours in Artificial Light.—All reds deepen in tone when seen in artificial light, but it is quite the reverse with yellows, which all appear much lighter; pale yellow, indeed, would be almost white. Blues and greens will deepen in tone. Green will brighten up with good artificial light; but dark blues are subdued, and sometimes appear almost black. Care should be taken not to get the shadow colour too deep: to avoid this, it must be put on thinly. If it is desired to make a good black, use brown lake and celestial blue in about equal proportions. When rubbing in clouds, the painter must not use any other yellow but yellow ochre, because when coming in contact with the sky blue it will not turn green so readily as any other yellow. This only applies to the rubbing in of clouds. Other yellows are used for laying in horizon tints and sweeping across the sky, as I have already mentioned in my remarks on the use of positive colours in cloud painting.

If the scenic artist resides in or near London, Messrs. Brodie & Middleton, of Long Acre, London, are about as good a firm as I can recommend for brushes, colours, and, in fact, every requisite for scenic painting. For canvas or cloth for painting on I would recommend that supplied by Mr. Alderson, Westminster Bridge Road, London: it is of double width, will not shrink, and runs about a shilling per yard.

In conclusion, I wish to say I have embodied in what I have already written the first rudiments of "The Art and Practice of Scene Painting," which I hope will be instructive to all readers of WORK who may have a taste and liking for this pursuit. At a future, but I trust not far distant, time, I hope to give some practical lessons on stage perspective and carpentry, especially in connection with scenery and scene painting, such as the making of profile wings, set pieces, borders, water borders, and how to set them in perspective, practical doors and windows, how to light the stage, mechanical effects, etc.

MEANS, MODES, AND METHODS.

AN EASY AND ACCURATE WAY OF GETTING CENTRES FOR DOWELLING.

OFTEN things want dowelling together that it would be almost impossible to measure for, to say nothing about the time and trouble, and the possibility of getting wrong after all. Take for example a couch leg that wants dowelling on. Get some fine brass gimp pins, as many dowels as you want, and lay them with the heads (on the couch frame) where you want the dowels to come; now place the leg on top of the pins where you want it to come, give a sharp tap with a hammer on top of the leg, and lifting it off, you have centres marked on both surfaces at once by the heads of the pins. This method can be employed in nearly all kinds of dowelling.

H. H.

MODE OF STRIKING OUT ELLIPTIC HEADS FOR DOORS, ETC.

To mark out an ellipse with compasses is rather a lengthy proceeding; to sketch one by the rack of the eye (as workmen term it), half at once, and then turn it over and mark the other half, is rather a primitive way when a true ellipse of any given size can be struck in a few minutes by following out the instructions given below. Get a strip of wood half the whole length of the desired ellipse and notch it out the whole height you want the ellipse (see Fig. 1). Proceed as follows:—Get the wood on which you want an ellipse, and with a square mark a line up the centre, and place a strip of wood down the edge of the

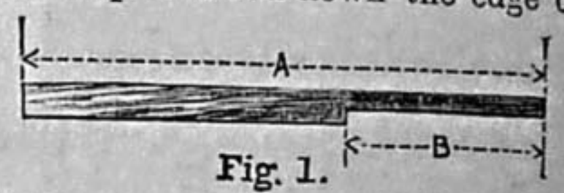

Fig. 1.

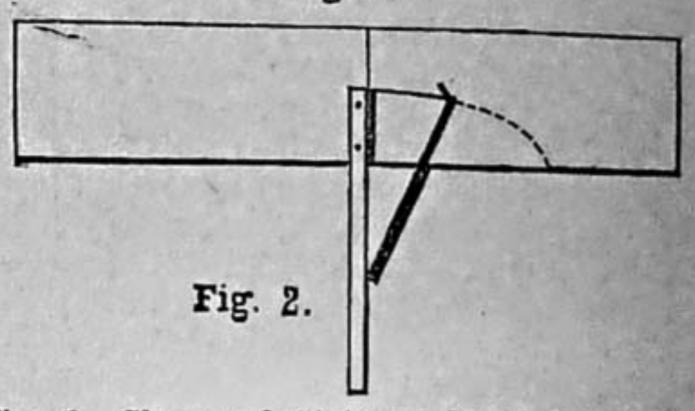

Fig. 2.

Fig. 1.—Shape of Strip of Wood for striking Ellipse. Fig. 2.—Mode of using Strip to strike Ellipse.

line; secure it in its place by means of two sprigs slightly driven in, or thumb cramp, or anything handy, and placing the notched strip of wood up the side of it, it will at once give you the height. Now, with pencil held on the top end of the strip, and the other hand to guide the other end, work it carefully along, keeping it close to the strip that is fastened down with your left hand, and with the right hand working it from you and keeping it close to the bottom edge of board at the same time, and it will describe half the ellipse (see Fig 2).

By reversing the strip of wood to the other side of the centre line, and working the notched stick the other way, you will have an ellipse quite true. A little practice will enable anyone to mark out all sizes by simply altering the notch and length of stick.

I have frequently made use myself of the method of striking an ellipse as described above, and I trust that many readers of WORK will find it as desirable and serviceable as I have.

H. H.

HANDY APPARATUS FOR HOME BOOKBINDING.

BY JOHN MORRISON.

OBSERVING that papers on the "Practical Details of Bookbinding" have appeared in WORK from time to time, and that, as a consequence, a numerous section of its readers seem desirous of giving practical effect to them, judging from inquiries regarding bookbinding tools, etc., I propose to give a short description and sketch of some tools suitable for home make and use which will, I am sure, start a few to bind their weeklies and monthlies that at present are either lying as so much waste paper, because unsuitable for handling, or are put into the fire as soon as skimmed over, and

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much valuable, interesting, and useful information lost which would otherwise have graced their bookcase in a handy and compact form, suitable for reference at any time, both for information and amusement.

Of all the different subjects treated upon in WORK suitable for "hobbies," I think bookbinding will commend itself to the greatest number, because most readers will have lots of material to start upon: perhaps not worth paying 3s. 6d. a volume for in the regular way, but still, worthy of a place on the shelf. One thing which damps the ardour of a beginner is the almost prohibitory price of bookbinding (professional) tools. If one grudged the price of getting their papers done by someone else, to buy tools and do so himself looked like jumping out of the frying-pan into the fire. Of course, if one goes in for binding in calf, morocco, gold, etc., etc., the expense of outfit is all the more. But I think what the average reader requires is an outfit which will enable him to bind his matter in a strong, handy, and convenient form, not so much for ornament as for use, but, of course, at the same time to have a presentable appearance in his bookcase. I have bound all my own in this style, the sewing, banding, and hingeing being of the strongest kind, and for covering I have used nothing but good cloth (imitation leather). I would advise those who try it to go in for good large-grained (embossed) cloth, as the cheaper kinds are not so easily manipulated.

Well, to proceed with our handy binding apparatus—one of our first wants is a screw-press of some kind to put our numbers into less bulk after we have folded them neatly, and knocked them up as well as we are able. It is not so difficult to make a press in the ordinary way, but as we have to do many things with this appliance—pressing, cutting, backing, etc., screwing-out and screwing-in—and as it is not very heavy, it is always shifting on our table, or whatever we have it across, and this is likely to make us grumble. Well, to remedy all these inconveniences, and give us some extra conveniences, I ask you, in the first place, to get a box. Either make it, or you may be able to get one at the grocer's—size, say, 2½ ft. to 3 ft. long, 2 ft. ends, and 2 ft. deep. Next, from the joiner's, get two bars of wood, A, B, same length as inside measurement of box, and place as shown in Fig. 2. These are to make our screwing, ploughing, etc., etc., press; and observe they must be of hard wood: beech, properly dried and seasoned, is, I think, preferable to any other. They must be 5 in. deep and 4 in. broad, and they must be planed straight and squared up. If you get a joiner to finish them up for you, he may bore holes for the screws, C, say 1¼ in. diameter. Inside of box, on ends, nail two bars of wood, D (as shown by dotted lines in Fig. 2), 5 in. from top, so that press bars, A, B, when placed on them, will come level with top of box. The next thing to be done will be to get screws and nuts to fit, and these we can get the blacksmith to make for us, say 1 in. or 1¼ in. diameter, of a shape as shown at C, and on the nuts have tails with two holes for screw-nails to fasten into the press bar, cutting hole in wood to insert the nut flat. Now, when we put in our screws right through front of box and bars, we have a press that will suit all our purposes.

Our next requisite is a sewing-frame, which you will see, from Fig. 3, is very simple, and need not cost much. I need not enter into detail, as you will see it is simply a flat bottom with two screwed uprights, and cross-bar with nuts below for the purpose of keeping bands or strings tight while we are sewing book. It will be observed that there is a slit immediately below cross-bar and between the uprights, to allow of strings going through and being fastened on the bottom with a tack or anything handy. A wooden screw upright is preferable, and the ends need not be glued into the bottom, but fitted so that they can be taken out for convenience, and the whole stowed into the box while not in use.

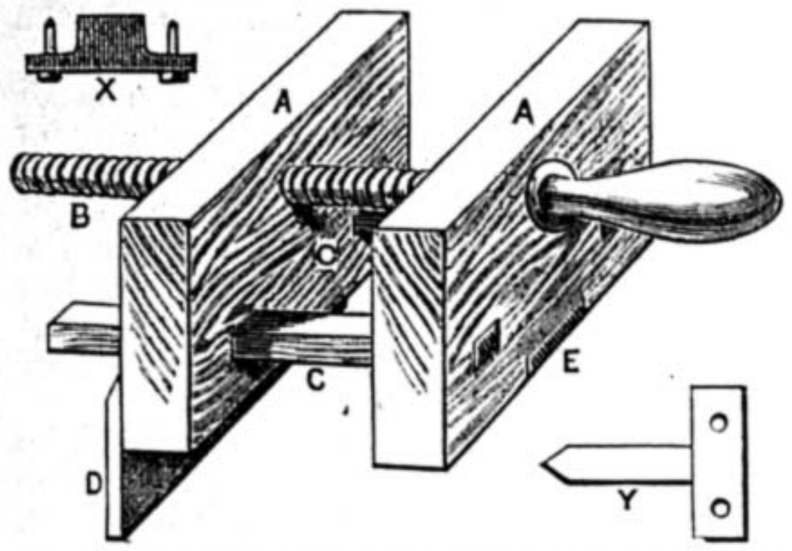

Fig. 1.—Plough for cutting Edges of Books—X, Iron Carrying Knife; Y, Shape of Knife.

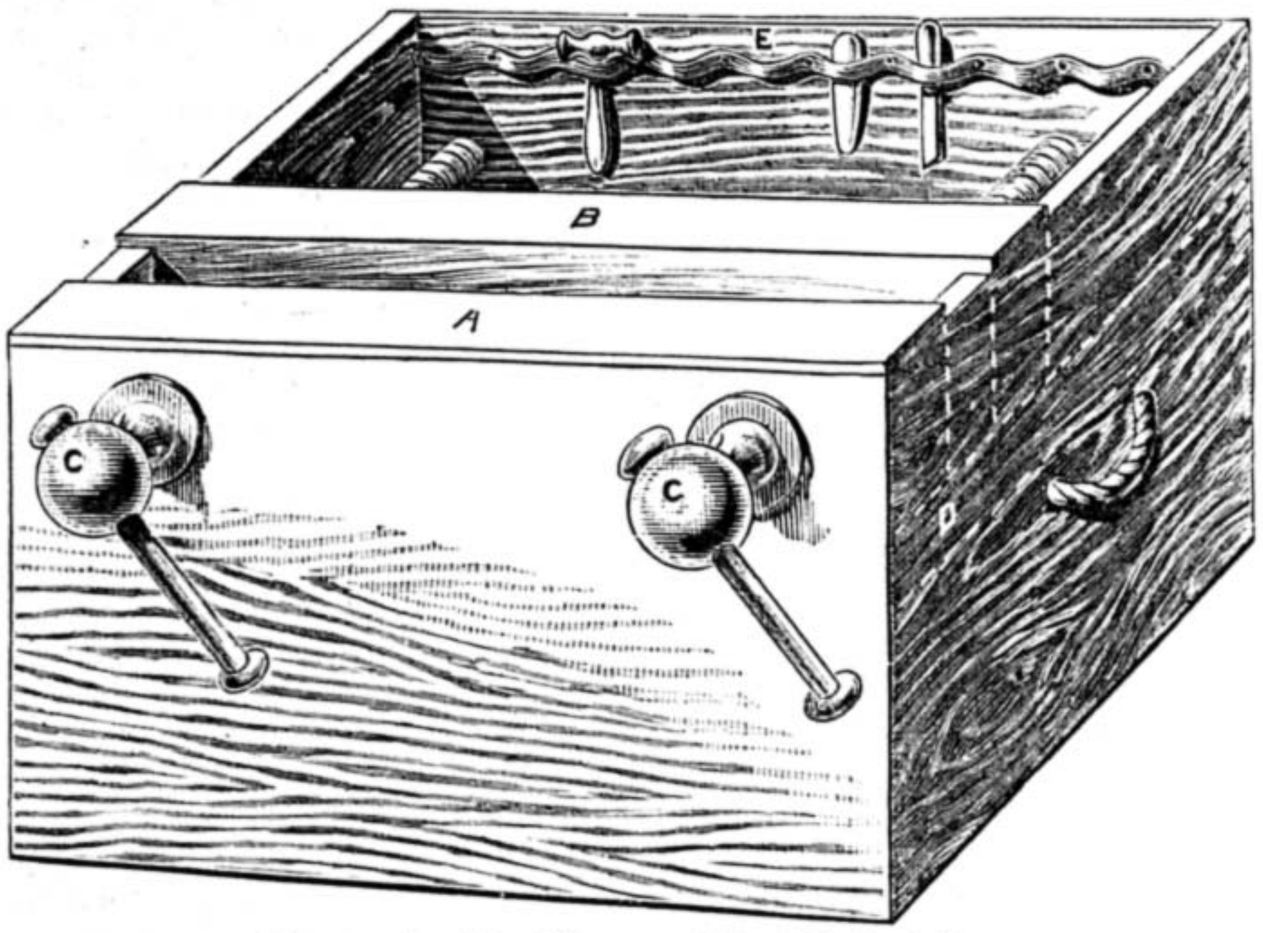

Fig. 2.—Combined Press and Bookbinder's Box.

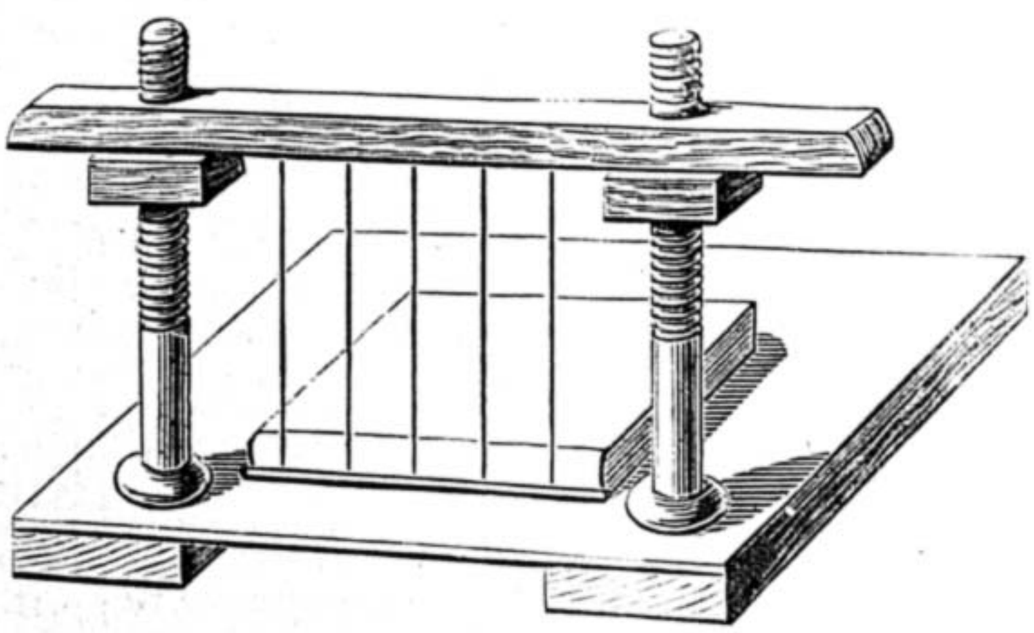

Fig. 3.—Sewing-Frame.

Our next necessity is a plough for cutting the edges of our books after being sewn and glued up. Procure from the joiner again two pieces of seasoned beech for sides of plough, A, A (in Fig. 1), size 8 in. long, 4 in. deep, and 1¼ in. or 1½ in. thick—all fair and square: we also require a screw for this tool, which may be ¾ in. iron, and nut with tail same as for press, to insert in one of the sides—namely, opposite side from handle. It would be much better, but not, as a rule, so easily got, to get a joiner to make you wooden screws, and, at the same time, to tap or screw hole in side piece to receive it, which would save trouble of inserting iron nut to receive iron screw. Two guides, C, C, say 10 in. long and 1 in. square, are fixed in handle side, say 1½ in. from bottom side, square holes being opposite in other, to allow same to slide. The cutting knife is also on this side, a notch being made to receive it, as shown at E in sketch, so that when put on with two screw-nails it is flat with wood, as will be seen from a look at drawing; right side piece bears up on handle, and to ensure it screwing back as well as forward, a hole is bored inside through screw spindle for pin and washer. This side we may say is now all of one piece, and will go out or in as required. But we have a slip of wood or iron to put on the other yet, so that it may hold on to press bar, B, while we are working it backwards and forwards to cut our edge held in press. This slip is shown at D, and is a piece of hard wood. We could have a runner on the top of our press; but we wish to avoid that, as it would be an obstruction in the way of our other jobs, which are many and varied, and it gives us a flat top for all purposes. I may mention here that when cutting book edge we require to grip it between two small boards of wood, allowing one side to stand above the level of press, so that when knife is finishing, the last of the leaves are cut up against this part of the board.

We have now got our tools finished, and we take another look at the press box. If it has been made of rough boards, without attention to joints, etc., we can, if we want it to have a better look, cover it with some nice pattern of wall-paper, putting white inside, then we can nail some strips of leather inside, and put in all our jobbing tools. Bore two holes in each end, and put in two pieces of rope, for convenience of lifting, its great advantage being that, when lifted on to chest, for instance, we have all we require inside: our sewing-frame, plough, millboard, cloth covering, etc., etc. Our litter and cuttings, instead of scattered about all over the room, will also find a convenient receptacle for the time being; and when we have done for the night, our box is lifted down and stowed away with its miscellaneous collection till such other time as required.

I may add that, instead of ropes, two cleats may be nailed to the sides of the box to afford means of lifting it.

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THE ART OF GRAINING.

BY A LONDON DECORATOR.

PAINTED IMITATIONS OF MARQUETRY—FURTHER METHODS OF EXECUTING GRAINED AND STAINED INLAYS, WITH SUGGESTIONS FOR THEIR PRACTICAL USE.

BEFORE considering, separately, the different treatments connected with the accompanying illustrations, it may be advisable for a brief space to gather up the "threads" of the preceding paper, so far as their bearing upon this concluding lesson is of present importance. In the former article I explained the processes usually adopted when simple combinations of woods are worked; whilst I endeavoured, by an illustration of ornamental effects, to secure the student's practical interest in this pleasing branch of decorative graining. Although arrangements of several different varieties of woods were therein explained, both of light upon dark, and *vice versâ*, the *principle* of working, whereby portions of a surface are temporarily protected—technically called "bound down," or "stopped out"—was, however, but briefly analysed. This point of interest and importance, as also that relating to colour-contrast between the component divisions of a design, will now profitably engage a little more attention.

The "Stopping-out" Process is the means to an end which, in its application to inlay imitations, rather puzzles the learner. He can usually discover how a dark ornament can be bound down upon a light ground, by simply stencilling the pattern over the walnut distemper graining with a thin coating of transparent varnish or gold size, and then cleaning off the remaining part with water; but to get the pattern light upon a dark wood, is altogether beyond his ken. The first point is to understand that the ground colour for the *lightest* variety of wood to be imitated must necessarily be the ground colour of them *all*, since any attempt to paint in the various creams, buffs, reds, etc., required for graining large surfaces would at once make the desired finished appearance of inlay a virtual impossibility. The next stage of enlightenment is reached when the student fully grasps the difference between graining the varieties in *oil* and in *water*. If we figure, in oil colour, a surface in light oak, and then, when dry, work over it an imitation of knotted oak, also by the oil process, with the notion of subsequently removing some parts of the latter, we should attempt a difficult task. Assuming that we could preserve the design by stopping it out with some vehicle, we should, in trying to remove the surrounding parts, have to use a solvent (turpentine), which would at once loosen also the light oak beneath. Hence, by using water colours, we are enabled to clean off the surface with water only; whilst the stopping-out varnish covering the portion to be ultimately displayed is not in the least affected at that stage. This principle is not at all an uncommon one in decorative and kindred practices. With glass embossing, for instance, we paint over—*i.e.*, "stop out"—that portion of the surface into which the acid is not required to eat. When the latter has done its work, we find that the Brunswick black is not affected by the acid, although by the use of turpentine we can readily clean the black off the glass, now that its purpose has been served. Other examples might be noted, but doubtless enough has been written thereon for the least experienced of my readers.

"Stopping" Varnishes of several different natures may be used, and the solvents for their subsequent removal must naturally be of kindred variety. Simple wood naphtha varnish will answer the purpose, and can be cleaned off with the same spirit. An ordinary spirit varnish of the "white hard" kind will, of course, require methylated spirit for its removal; whilst any painter's vehicle into which turpentine largely enters, will also answer the purpose. Those which I can confidently advise the learner to use are white hard spirit varnish for staining inlays upon real wood surface, and the finest Brunswick black for working upon oil-painted grounds. Canada balsam may be used for the more delicate and intricate of painted designs, but the above black varnish is as reliable for this work as it is for embossing. Turpentine, the solvent for the two varnishes last mentioned, is far less liable to damage a painted surface than the more "fiery" spirit solvents; hence their better suitability.

In manipulating the solvents some care and patience are necessary to remove the varnish. The former should be well flooded over the design, and the soft camel's-hair "dabber"—such as gilders and polishers use—should be employed, more for mopping up the solvent than for rubbing the varnish. If the spirit or turpentine is allowed to thoroughly loosen the varnish, no great difficulty will be experienced in removing it; but if much pressure and friction be used, the water-graining—held together only by the glutinous nature of the beer-fluid—will probably be loosened also. Before executing any permanent ornamental work, the novice should well practise this operation, and also aim to temper his varnishes with a little turpentine or white polish, respectively, in order to use them only of that strength necessary to protect the graining, and be the least trouble to clean off.

Colour-Combinations and Harmonious Contrasts of the Various Woods contained in any design is a branch of the subject requiring special study. One of the best sources of knowledge thereon is, naturally, the real marquetry work of a good make. If, added to this eye-training, the student will fix in his mind the few subjoined colour-notes, the artistic effect of his completed effort will be worthy his best executive labour. Although in painted imitation inlays the decorative effect should be almost wholly the result of ornamental lines and form, as brought out by contrast of shade—light against dark—we find that *stained* imitations of marquetry upon a plain wood surface give more legitimate scope for harmonious colour-effect. A large portion of real inlaid work is of the latter kind, in which the ornament consists of dyed woods of various light tints let into a dark surface of richly coloured wood. Even in combinations of grained woods, however, a slight knowledge of colour will enable us to get an enhanced effect without sacrificing the naturalness of the grain imitation:—*Complementary colours* are those which heighten the effect of each other by contrast when juxtaposed. True complementaries are such that balance each other, and which, if their colours be united, combine to reproduce white light. Sensations of colour which in their entirety are equivalent to white light are usually conceded to be *harmonious* combinations—that is to say, agreeable and pleasing to the educated mind of humanity. From this it follows that complementary colours are the basis of harmonious or correct colour-effects. Now, according to our modern theories and experiments, the complementary of a pure blue is a pure yellow, the complementary of pure red is a decidedly greenish-blue; whilst orange and blue (of an aërial hue), and lemon-yellow with its complementary violet, are the other chief pairs of opposing and balancing contrasts.

In applying these principles to our work we have therefore a scientific basis to build upon. We thus know that a yellow or golden colour wood will best harmonise with blue tints. Suppose we have, not a pure blue tint, but a violet or warm blue; the yellow, in such an instance, must also be modified by the addition of a little blue, making a greenish or chrome yellow. So also with red and its complementary; for if a purple-red (that is, with a little blue added), then must the complementary be made greener. In short, that combination of pairs which we make "warmer" on the one side, must be "cooled" on the other; hence orange "warmed" or reddened to a vermilion red must be contrasted by a complementary nearer to that of pure red than of yellow—viz., a greenish-blue.

When inlaying for colour-effect upon rosewood, this being a dark purple-red, the foregoing teaches us that greenish-yellow tints are most harmonious. Also we learn that amboyna (orange) hues are heightened by contrast with an "aërial" (or slightly green-hued) blue. Beyond this, it must be broadly laid down that combined shades and tints of the complementary colours can only be used in subordination to the inlay principle, and that the outline and form of ornament must be distinctive before all considerations of pure colour.

Executing Stained Inlays is, to the writer's mind, the most artistic outcome of a knowledge of imitating woods. Having so fully explained the method of "stopping out" in connection with painted imitations, there is no necessity to dwell upon its adaptation to working transparent stains. Any spirit or water stains, washes of grainers' pigments, such as the siennas, vandyke, indigo, aniline dyes, or "Judson's" stains, may be used. The best white sycamore makes probably the most suitable ground to work upon, and if, as is usually the case, we desire to retain some portions of its whiteness, it is best to give it, all over, two coats of clear or "Young's patent" size. These white portions are stopped in, and the size then cleaned off with warm water; when dry, the lightest stains are washed in, covered with varnish, and so on, until the complete design is covered in. The background of design is now stained and put in, perhaps as rosewood or walnut, and the varnish or balsam dissolved away, leaving the work sharp and clean for French polishing, or copal varnishing and hand polishing.

When executing such as the above, there is a natural tendency of the stain to spread beyond the confines of its portion. To remedy this, we may give the wood a preparatory coat of strong clear size, which partly fills the pores of the wood. In this case, however, the wood is not so properly stained. A better treatment, although a more tedious job, is to maintain an imitation inlay margin, or fine line, to the ornament. This can be either pure black or the white, unstained, colour of the wood. If the white line is desired, we paint this in with a fine sable pencil and Canada balsam before we lay in the washes of stain, which latter are then easily worked into their respective places. If a black margin is desired, we coat the surface all over (using a camel's-hair brush) with ivory-black and beer; when dry, paint in the outline with stopping varnish, and then clean all the black off with warm water.

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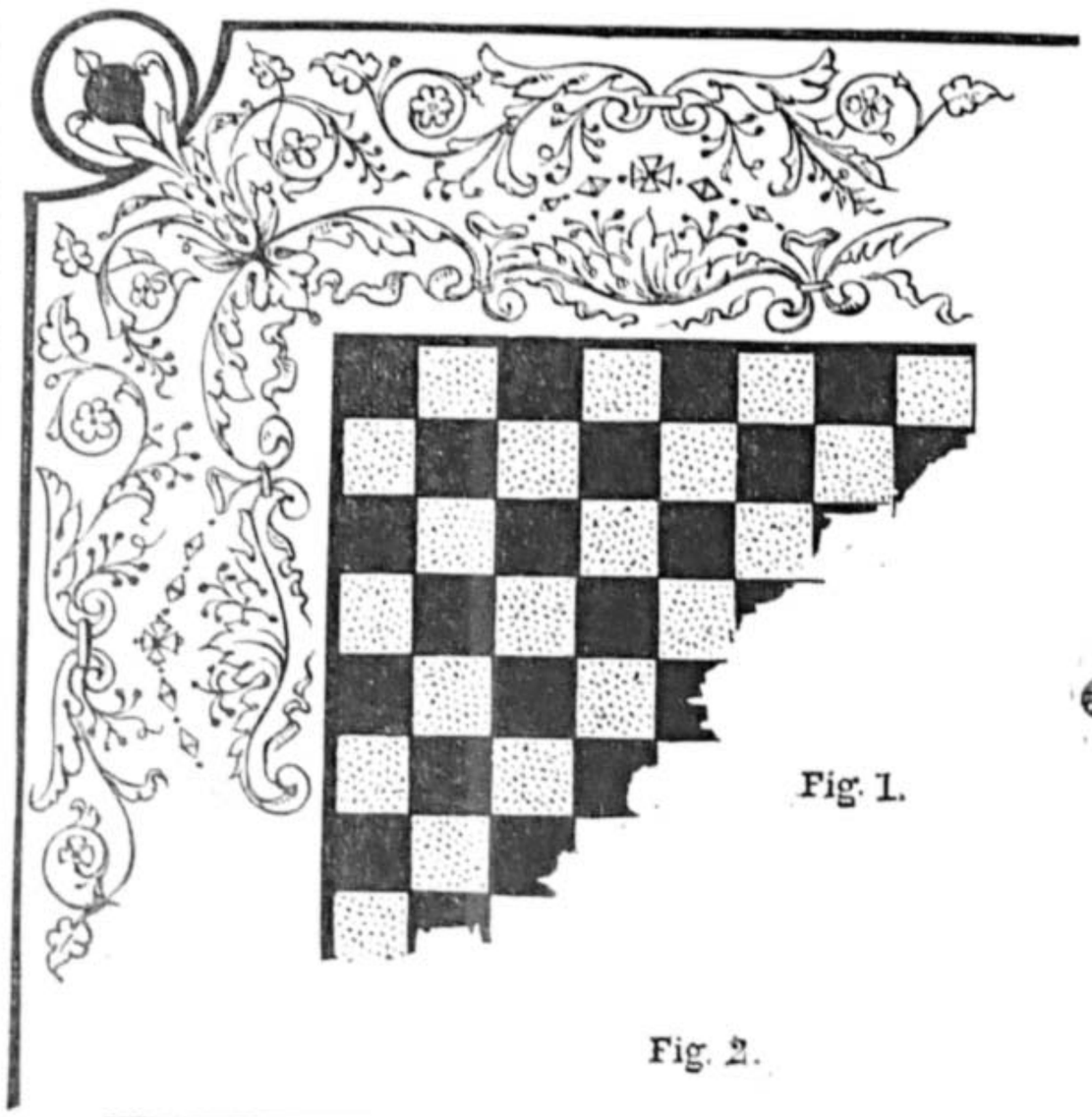

Fig. 1.

Fig. 2.

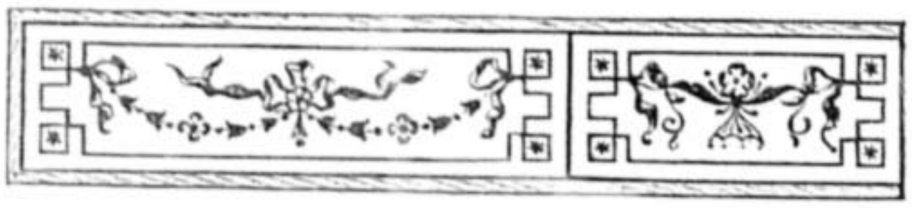

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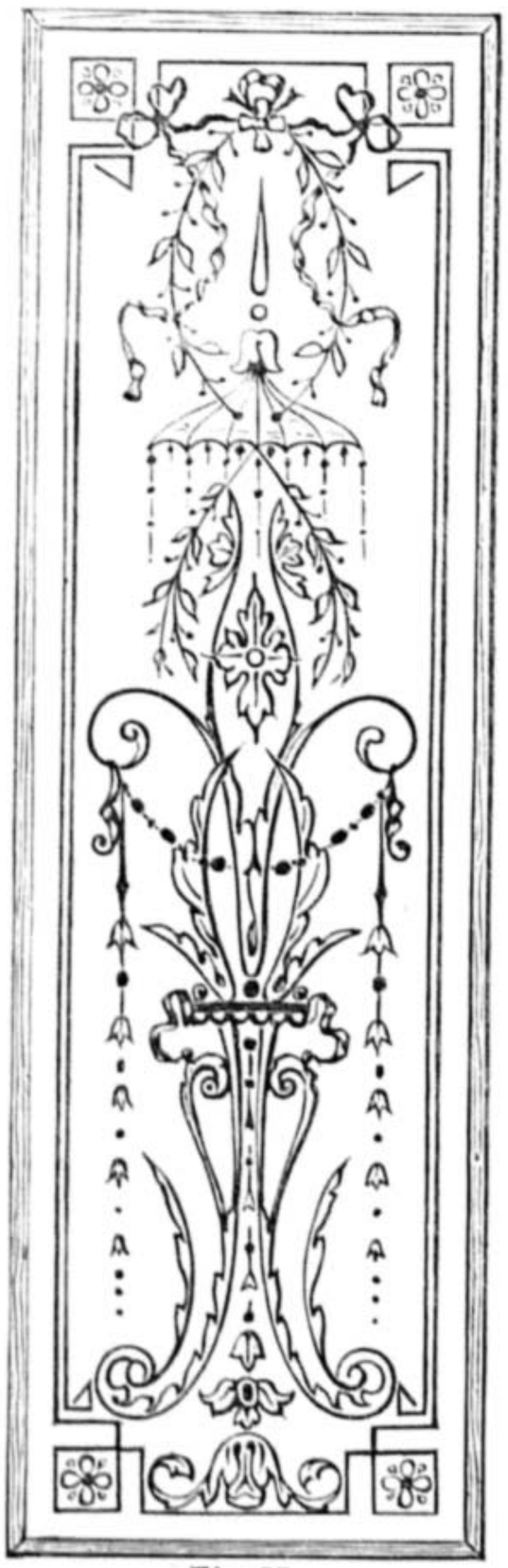
Fig. 10.



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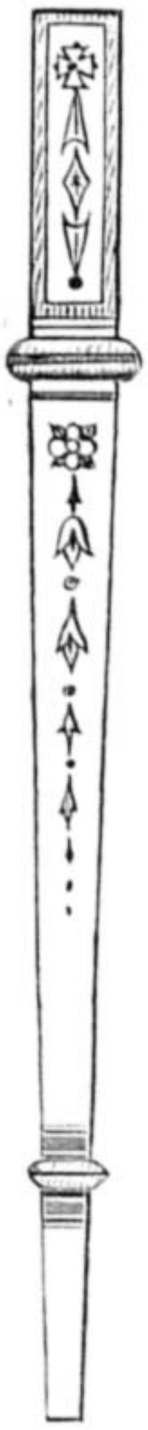

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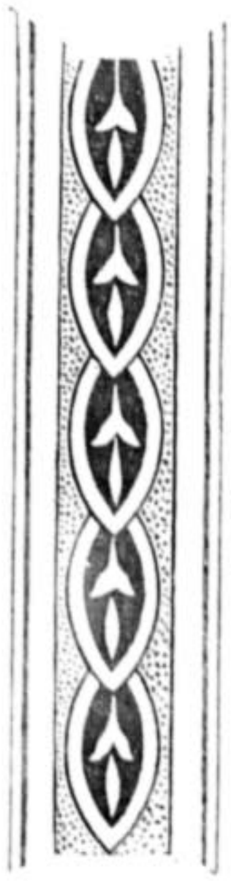
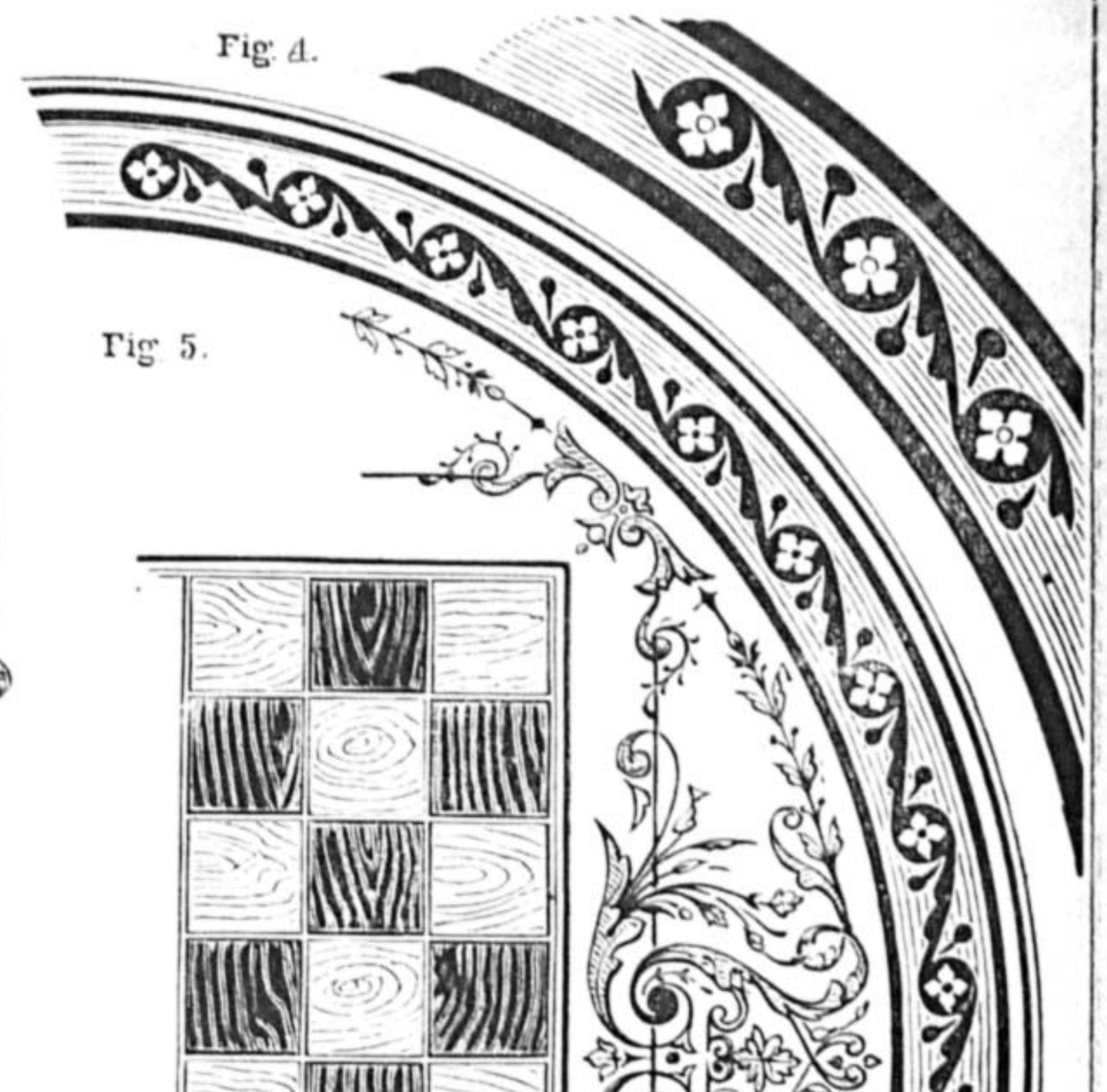
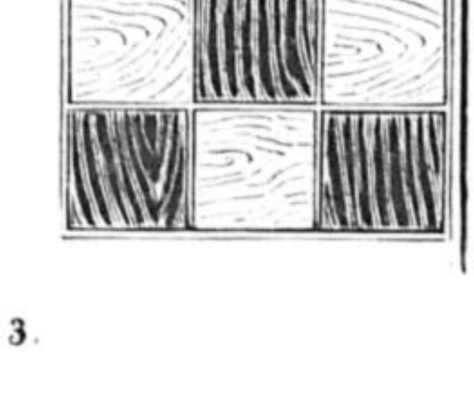


Fig. 8.

Fig. 4.

Fig. 5.





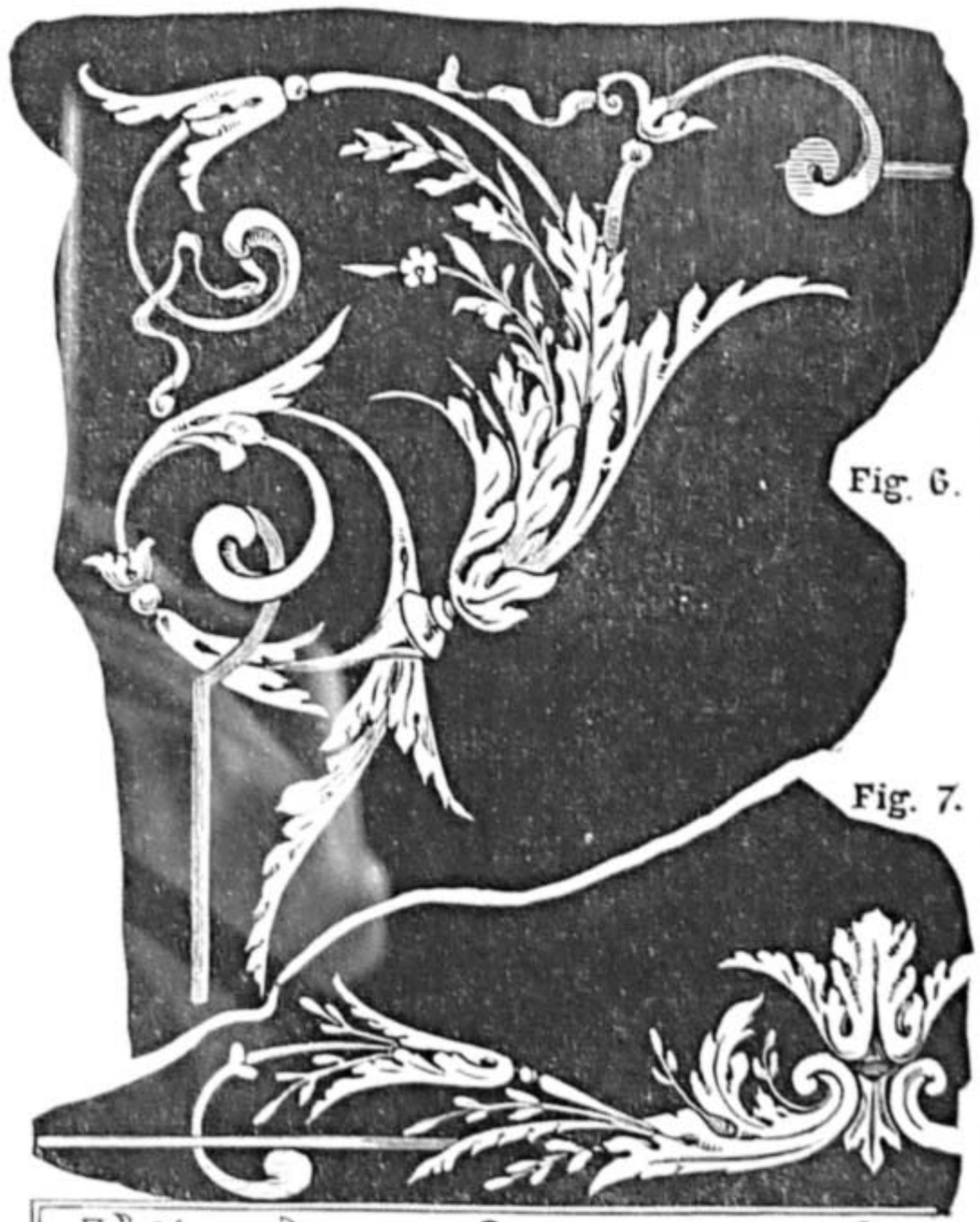


Fig. 6.

Fig. 7.

Fig. 12.

Fig. 1.—Card-Table Top (see WORK, No. 90). Fig. 2.—Suggestion for Drawer Fronts. Fig. 3.—Square Table Leg. Figs. 4 and 5.—Circular Card-Table Top. Figs. 6 and 7.—Corner and Break for Ivory on Ebony. Fig. 8.—Simple Border in Three Woods. Figs. 9 and 11.—Imitation Inlay as Applied to Finger-Plates. Fig. 10.—Bracket Panel. Fig. 12.—Drawer Front for Music Cabinet.

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In both cases, it need hardly be said, the double coating of patent size must be temporarily used, and then removed after the outline is stopped in. Were this neglected, it would be impossible to entirely remove the superfluous black stain in the latter instance; whilst in the white outline the sizing prevents the varnish running, and enables a sharp clean pencil-line to be made. Imitation ivory is inlaid upon ebony in this manner also. The ivory ground is nicely got up and finished; the design is then stopped in, and the whole surface carefully coated with the beer-black. The solvent is finally very carefully applied over the design; and when the varnish is thus softened and removed, we have a solid white ivory ornament against ebony ground. The ornament may be hatched and finished by a very fine sable pencil, and fine black from the tube.

Turning now to the illustrations, Fig. 1 shows a suggestion for treating the card-table of Mr. Scott's invention (Vol. II., page 605). The imitation inlaying of the draught-board in ebony and boxwood would provide good practice, and be more attractive than black and white paint. The ornament might be in light harmonious tints upon rosewood or walnut. Fig. 2 is a simple suggestion for treating the drawer fronts and sides; whilst Fig. 3 could be applied to the straight table-legs. Figs. 4 and 5 are for a circular card-table top—the squares in satinwood and rosewood; the ornament surrounding it in light tints upon dark; but the border would be more effective with the order reversed, dark against light. Figs. 6 and 7 are corner and break ornaments for cabinet panels of inlaid ivory on ebony. Fig. 8 is an effective border for three woods. Fig. 9 is a somewhat Elizabethan design applied to a finger-plate. This and Fig. 11 are drawn about one-fourth full size. The former, in satinwood upon walnut or ebony, would make a nice finish on a grained door in satinwood or maple. Fig. 11 should be used on a dark door, and be executed in rosewood upon a light wood. Fig. 10 is an ornamental arrangement that could be easily adapted to the panels of a hanging bracket of similar proportion. Fig. 12 is an ornament for the fronts of a music cabinet; it would look well in either ivory or light harmonious tints upon walnut or rosewood of quiet grain.

All the treatments herein suggested can be modified or entirely rearranged to suit the individual worker. The fine lines should be either executed with a carriage-liner, or with a small artist's bevel-edged fitch. The designs require first careful drawing to the exact size, and then to be pounced or traced upon the ground. For good work, a thorough command of the pencil for outlining is absolutely necessary, since the least want of balance or symmetry in ornament of this Italian type would condemn the whole thing. The execution of these and much better designs should be possible to all who have followed my instructions; whilst any portion of the work requiring further explanation can be attended to in the invaluable columns of "Shop."

With this paper I bring my articles on the "Art of Graining" to a conclusion. I regret very much that the exigencies of space have in some cases prevented me from entering upon matters which are at all events indirectly if not directly connected with my subject, and in others have constrained me to abridge my remarks to a greater extent than I could have wished. I have the satisfaction, however, of knowing, that in no part have I been too diffuse.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of* WORK *for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of anyone who has a useful article for sale to obtain mention of it in this department of* WORK *without charge, the notices given partake in no way of the nature of advertisements.*

129.—SOME USEFUL BOOKS AND PAMPHLETS.

"Physique: A Journal of Physical Education."—This is the first number of a new journal dealing with domestic, school, and personal hygiene, gymnastics, athletics, games and sports, published monthly at 6d. by Messrs. George Bell and Sons, York Street, Covent Garden, London, W.C. It contains ably written and interesting papers on "Overcrowding in Towns and its Remedies," "Physical Sports of the Ancient World," "The Claims and Limitations of Physical Education in Schools," "A French View of English Athletics and Games," "A Training College for Teachers of Physical Education," and miscellaneous matter *à propos* to the aim and scope of the magazine, which is sufficiently indicated by the titles of the papers mentioned above.

"Photography in a Nutshell."—This summary of everything which it is desirable that a photographer should know in connection with the art that he practises is written by the "Kernel," and published at 1s. by Messrs. Iliffe & Son, 3, St. Bride Street, London, E.C. It is stated to be the result of personal experience, and modes of procedure gleaned and gathered from the practice of others. It is certainly marvellously comprehensive, and seems to deal with every point on which an amateur would require information. It contains some excellent prints, among which a view in North Wales, by the Woodbury-type Company's new process, and a bit of rural scenery, "In the Thames Valley," a Kallitype print by a new printing process, invented by Professor Nicholls, and worked by Messrs. J. Lewis & Co., Birmingham, deserve special mention.

"The Art of Retouching."—This important procedure in the treatment of negatives before printing, with hints on portraiture and flash-light photography, is well dealt with by Mr. J. Hubert, photographer (Silver Medallist), 238, Mare Street, Hackney, in this nicely printed volume, which forms No. 6 of the "Amateur Photographer's Library," and is published by Messrs. Hazell, Watson & Viney, Limited, 1, Creed Lane, Ludgate Hill, London, E.C., at 1s. in stiff paper covers, and 1s. 3d. in limp cloth. The necessity for retouching negatives before printing is demonstrated to the eye of the reader by the frontispiece, which shows two prints, one from the negative not retouched, and the other from the same negative retouched, as practically and as forcibly—if not even more so—than the author's pertinent remarks on the subject.

"Evening Work for Amateur Photographers."—To judge from the number of books that are published on photography nowadays, it seems as if about half the people in the world were photographers and spent most of their time in photographing the other half, and all the choice bits of the world itself. This volume—nicely turned out in a serviceable scarlet livery by Messrs. Hazell, Watson & Viney, Limited, 1, Creed Lane, Ludgate Hill, London, E.C., at what price I am unable to say positively, but probably at 3s. 6d.—is from the pen and practical experience of Mr. T. C. Hepworth, F.C.S., Lecturer at the late Royal Polytechnic and Birkbeck Institutions, and author of "Photography for Amateurs" (Cassell and Co., Limited, 1s., or cloth 1s. 6d.) and "The Book of the Lantern," etc. etc. It is well and abundantly illustrated with camera and pencil by the author. The aim and scope of the book are chiefly to show how the amateur photographer may best employ the time that he can devote to the prosecution of his craft in the winter months, when outdoor work must be given up for a time by all but those who can encounter the rigour of the season in the open air. THE EDITOR.

SHOP:

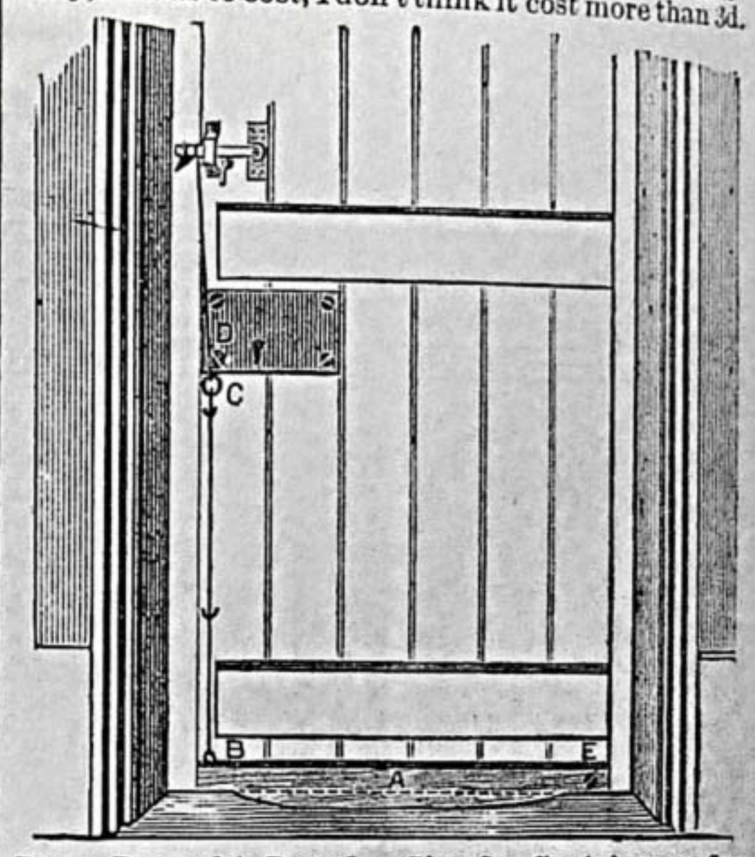
A CORNER FOR THOSE WHO WANT TO TALK IT.

*** *In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—LETTERS FROM CORRESPONDENTS.

Door Draught Board.—J. W. B. (*Birkdale*) writes:—"The attached is a sketch of a very simple contrivance which I am sure may prove very useful during this inclement season to many of your readers. Many stone door-steps, and especially backdoor steps, are liable to get worn hollow in the middle, thus causing very uncomfortable draughts along the floor. Landlords cannot always be persuaded to remedy such trifles, and the tenant has to resort to mats, etc., which, however, have to be removed each time the door is opened. I have had one in use now for about twelve months, and it answers the purpose admirably, and as to cost, I don't think it cost more than 3d.



Door Draught Board. Simple Contrivance for keeping out Cold Winds when the Step has worn hollow. A, Draught Board; B, Staple for Wire; C, Curtain Ring; D, Bolt-Head; E, Screw.

Get a rail, A, say of ½ in. board, cut to the exact shape of the hollow by scribing (I think the joiners call it), and fixed as in drawing by a screw at E, the other end of course, loose, but attached to a thin wire (such as they tie up flowers with). The wire ends with a curtain-ring, C. When the draught preventer is not needed, simply lift the ring on to the bolt-head, D. In this way the draught-board is raised clear of the floor, and causes no inconvenience. By continuing the connection with a piece of string to the latch-bar, it becomes self-acting, as by lifting the latch and holding it, you also lift the draught board. The upper portion is better made of string, as wire would be too much in the way—but wire should be employed for the lower, because it does not stretch."

Portable Carpentry.—EMIGRANT writes:—"I am about to start for distant lands, and shall leave much behind me, especially many articles of furniture which I have made from descriptions given in WORK. I regret now that all my articles were not upon the 'take to pieces' principle; and possibly it may be worth while to give the 'tip' to readers to go in for portable carpentry, and your writers might enlighten myself and others in respect to a few useful articles upon this principle."

Kettle Spouts.—R. A. (*Salisbury*) writes:—"I notice in 'Shop' (page 715, Vol. II.) a letter from a correspondent signing himself TOM, on the subject of kettle spouts. It is a pity that TOM should have made such a blunder as he has done. He says that a correspondent had pointed out (and rightly) the faulty way in which he had been told to make them. Now, the querist who made the first grumble about the matter, did *not* complain of 'the faulty way he had been told to make them,' but because he had not been told the way to make them at all. Next, the spouts that were inquired for were the ordinary common tea-kettle spouts, not the brazed and bent ones; and copper and brass spouts did not enter into the question. I will just say here that not one tinsmith in twenty could turn out a good finished spout of the description given by TOM *in iron*, and the very few who could do such a job would far rather

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buy them at about 4d. each, than take two hours to make and tin one themselves. The last sentence in TOM'S epistle about being 'frilled in the lead, bent and planished,' is beyond my comprehension."

T-Squares.—J. T. B. (*Kirkham*) writes:—"A little additional information on the construction of

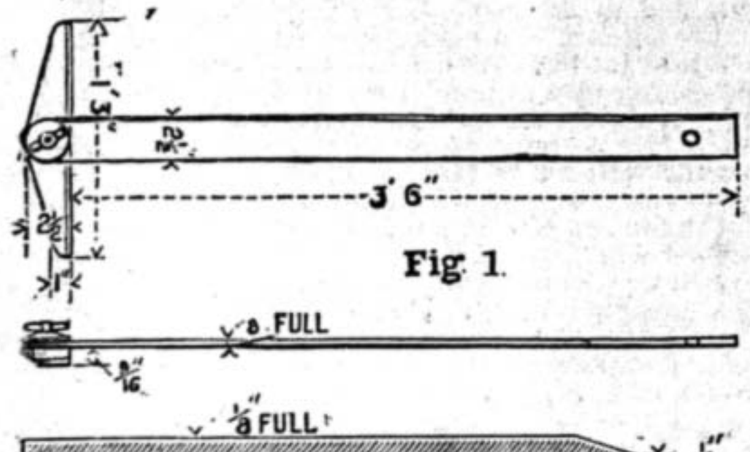
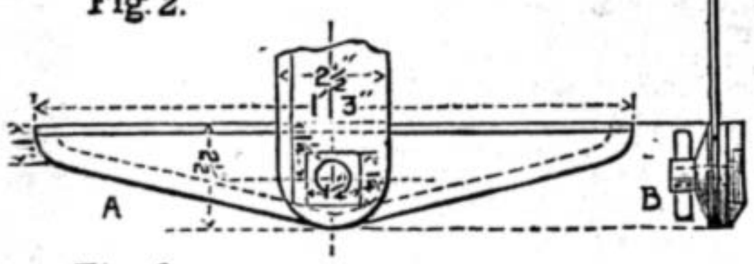


Fig. 1.

Fig. 2.



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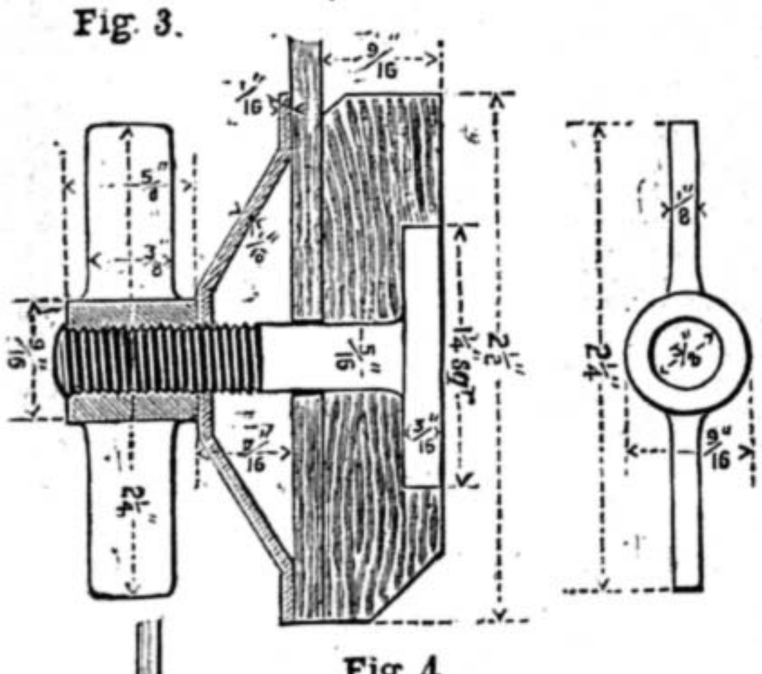

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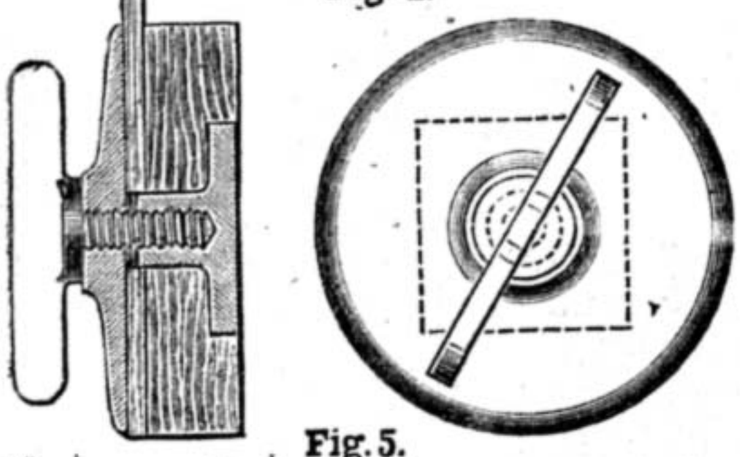

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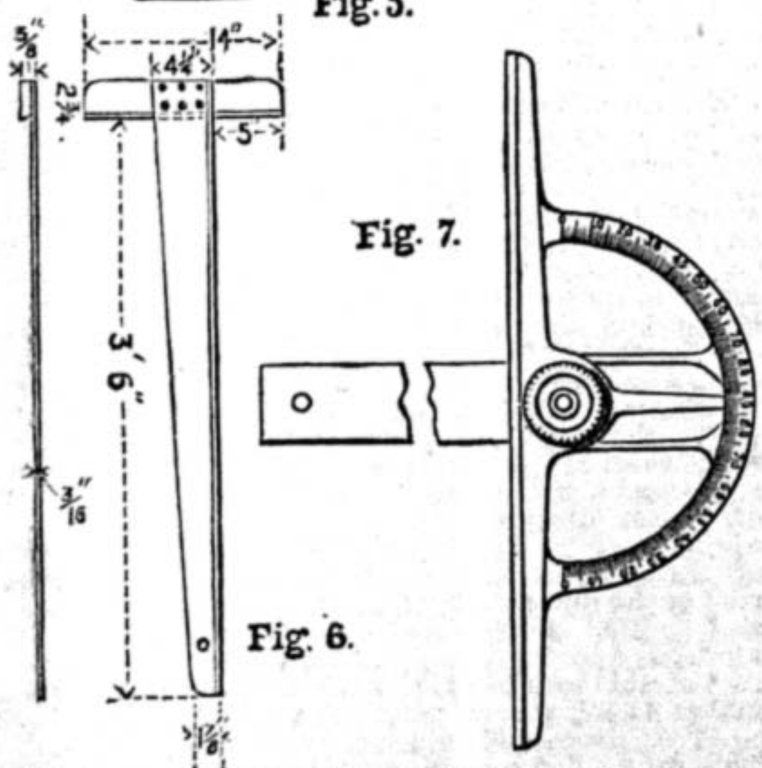


Fig. 6.

Fig. 7.

T-Square. Fig. 1.—General View. Fig. 2.—Cross Section of Blade. Fig. 3.—Stock, Blade, and Section. Fig. 4.—Wing-Nut. Fig. 5.—Lock. Fig. 6.—Taper Blade. Fig. 7.—American T-Square.

T-squares may be acceptable to many of your readers. I furnish drawing showing a very handy swivelling square, one of which I have used for many years, and much prefer to any fixed blade. Fig. 1 shows general dimensions; Fig. 2 shows cross section of blade; Fig. 3 plan of stock and blade, also cross section giving dimensions of brass-bolt cone washer and wing-nut (the stock, instead of being parallel in width, is cut down at the ends to save weight, and is also chamfered underneath for the fingers); Fig. 4, top view of wing-nut. Fig. 5 shows an alternative locking arrangement. It does not stand so high, but it cannot be so firmly tightened as Fig. 3. Apple or pear tree is excellent wood material for stock and blade. It may be urged as an objection to the swivel blade that, after using on the angle, it requires re-setting to a right angle. Now, as a rule, a draughtsman has his drawing-board with at least the left hand and bottom edges square, so that the blade can be re-adjusted instantly; or again, before angleing the blade, he will rule a square line across his paper, to which he re-sets the blade. Where one has frequently to work on the angle, this style of square is very useful; the stock lies flush with top of board, and set-square can be worked over it. It is not so clumsy as the double shifting stock shown in Fig. 7, p. 625. Fig. 6 shows ordinary fixed taper blade and stock. Working edges of blade and stock may be lined with ebony or vulcanite to suit taste. Fig. 7 shows an American T-square with swivel blade and stock prepared for setting out angles up to 180 degrees. Sketch explains itself. Extreme length of head is 8½ in.; diameter of arc is 4½ in. divided to ½ degrees; blade, 1¼ in. wide; the heads are made of bronze, and the blades of steel. Price, with 30 in. blade, £3 7s. 6d.; ditto, with 36 in. blade, £3 12s. Darling, Brown & Sharp, of Providence, R. I., are the makers."

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Dynamos and Motors.—J. E. W. (*Wolverhampton*).—Dynamo-electric machines will generate an electric current when driven by any motive power, or they will receive electric current from any other generator and convert a part of it into motive power. All dynamos may be used as electro-motors, but all are not equally efficient when used for this purpose, and the arrangement of brushes must be modified to fit any of them for electro-motive work. If current is sent through a dynamo, it will run backward against the brushes, and thus rough them. Some forms of motors are also provided with reversing levers attached to the brush rockers, and their general form is more compact than that of dynamos, although some makers have both of the same type. The peculiarity you notice in the F.M. cheeks is merely accidental or whimsical, and in no way distinguishes one from the other.—G. E. B.

Electrical Science.—YOUTHFUL ASPIRANT (*Kettering*).—There is no "vagueness about things electrical." They are as sure and as certain, and as amenable to laws, as those "problems based on the good old foot-pound system" you are in favour of. Respecting dynamos and motors, electricians know very well how much iron to put in the carcases of these machines. The F.M.'s must only be half saturated with magnetism. Soft malleable iron will take 2,500 ampères of current per square inch to saturate it—hence the F.M.'s are made massive enough to be only half-saturated when the maximum exciting current is passing through their coils. This determines their size and weight. The proportion between them and the armature should be as 7 to 1. The wire to be wound on both is determined by the voltage and volume of current required from the machine. As you have "Electricity in the Service of Man," and understand formulæ, kindly refer to pages 337, 338, and 339, where you will see this explained. You will also do well to read from page 326 on to page 334, and carefully study the formulæ and diagrams there. The voltage of a lamp is obtained by actual measurement. The resistance, the same, not by tables. "Dynamo-Electric Machinery," by S. P. Thompson, is a costly but good book on the subject. A cheaper, but very good little manual, is "Practical Dynamo-Building for Amateurs," by F. Walker. On pages 18 to 28 of this little book you will find formulæ for calculating the winding of dynamos. If you have a hundred or two pounds saved up, you may enter a school of electrical engineering, or bind yourself apprentice to an electrical engineer for three years. This will gain you an introduction to the branch you inquire about.—G. E. B.

Oil and Paint.—A. M. (*Birkenhead*).—The quantities of driers, oil, and turpentine required to make one cwt. of white lead to the consistency of paint, is a matter that must be varied according to the conditions of the work it is required for. In summer-time, one pound of good driers to fourteen of white lead is ample for out-door purposes; in winter-time, one in ten would be best. The quantity of oils required would be about one and a half gallons for the cwt. of lead. What proportions of linseed-oil and oil of turpentine it is advisable to use, depends entirely upon the purpose we intend it for. For full and practical instructions on this, which is beyond the scope of a "Shop" answer, see papers on "Plain and Decorative House-Painting" in WORK, Vol. I.—F. P.

Clock-Cleaning Articles.—J. T. (*Huddersfield*).—The first article on the above appeared in WORK, No. 98. There have been some papers on "Hints to Watch Wearers," and also many replies in "Shop" on "Watch and Clock Cleaning," which might prove useful to you. Refer to the Indexes of Vols. I. and II. (when ready) of WORK.

Inlaying.—T. W. (*Bradford*).—All the back numbers of WORK are in print, and obtainable of the publishers, Messrs. Cassell & Company, London, E.C. A reference to the Indexes of each volume will enlighten you as to what has appeared on inlaying.

Gutta-Percha.—T. G. S. (*High Wycombe*).—Try the India-Rubber, Gutta-Percha, and Telegraph Co., Limited, 100, Cannon Street, E.C.; or the North British Rubber Co., 57, Moorgate Street, E.C.; or the Victoria Rubber Co., 74 and 75, Fore Street, E.C., for the rubber you want for making small balls.

Electric Belt.—G. F. R. (*Woolwich*).—The most simple electric belt I am acquainted with is made in the following manner:—Get an ordinary body belt, made of canvas, webbing, or flannel: it matters not which material is employed. Next get some round pieces of sheet zinc, any thickness, the size of pennies—about a dozen or so—and an equal number of round pieces of sheet copper the same size. Punch or drill a few small holes around the rims of each zinc and copper disc, and sew them by means of these holes at equal distances on the belt, the zincs inside next the body, and the coppers outside. Now get some silk-covered braided fine copper wire, as used for the flexible cords of telephones, and connect the copper discs outside the belt with the zinc discs inside the belt, by soldering the end of a length of wire braid to a copper disc of one pair; then pass it through the belt, and solder the other end to the zinc plate of the *next* pair, and so on. Connect a zinc at one end and a copper at the other, with metal clasps on the belt to complete the circuit when the belt is put on. Cover the zinc plates with pads of thin flannel, to prevent chafing of the skin.—G. E. B.

Circular Saw Hammering.—H. S. O. (*Hammersmith, W.*).—I know of no book dealing with the whole art of saw hammering, but there is a work by Spon, in which saw hammering is briefly dealt with. I have had a little practice in saw hammering from it, and have information which I have gained of men at the trade. Perhaps the following may be of benefit to you and others. As a rule, circular saws in working become loose at and near the rim; consequently, the centre of saw is tight, which causes the saw to wobble; and even if it makes a true cut, it wastes more timber than is necessary. To get a saw-plate in the above condition true, the dog-head hammer should be used. Fig. 1 gives a rough sketch. It will be seen that the face of this hammer is a little convex, and that the handle should be at an angle of 80° or 85°. The blows

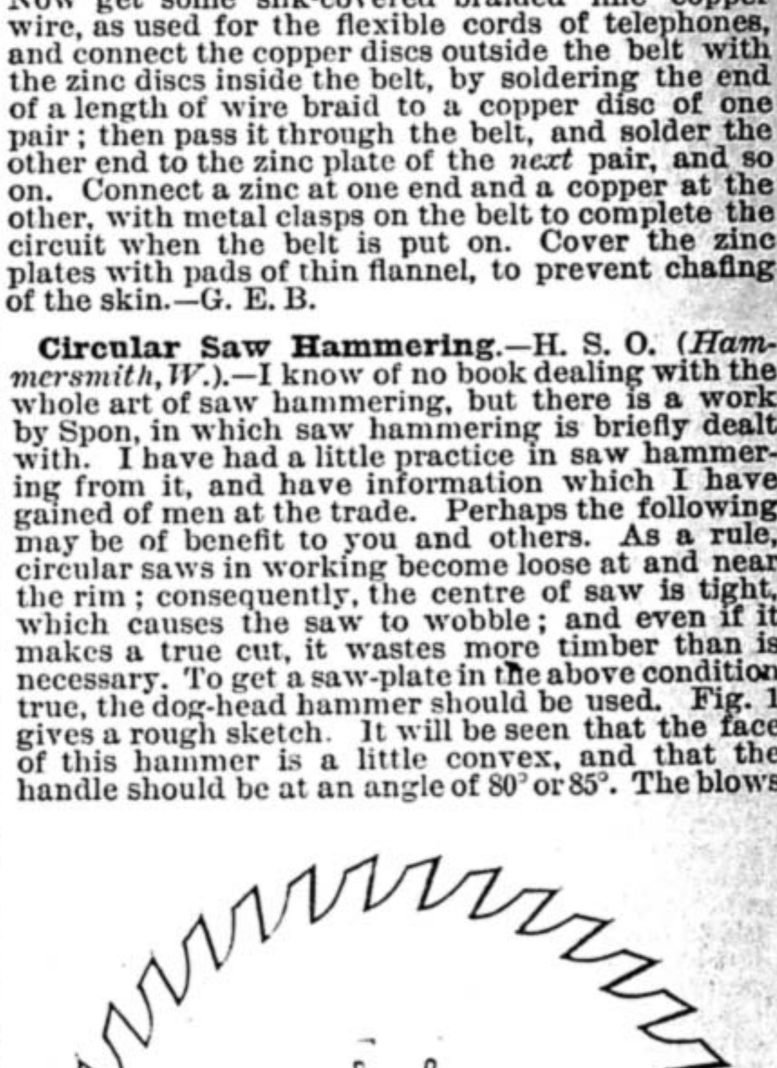


Fig. 2.

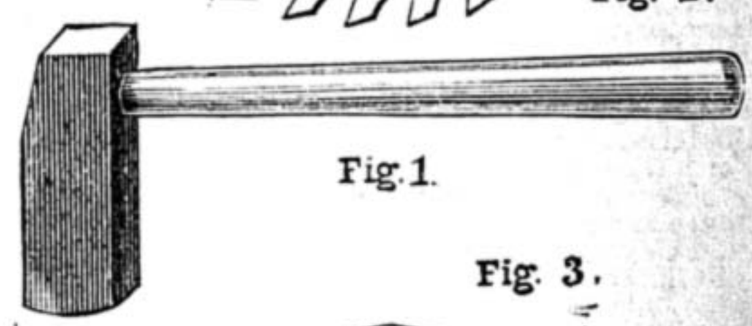
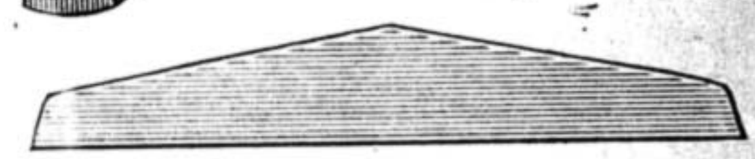


Fig. 1.

Fig. 3.



Circular Saw Hammering Plate.

given should be on both sides of the saw-plate, and as indicated by the round marks in Fig. 2. It should be borne in mind that too much hammering should not be done before the straight-edge (Fig. 3) is placed on the plate to see if it is true; as soon as the plate is true with the straight-edge the hammering should cease. The force of blow given with the hammer should vary with the thickness of saws. A saw of stout gauge, of course, will require a heavier blow to have the same effect as on a thin saw; and before you commence to hammer see that your saw is properly bedded—that is, it should lay dead on the anvil.—A. R.

Thermometer.—E. N. (*Herne Hill*).—The subject, "How to Make a Thermometer," will, I have no doubt, find a place in the columns of WORK in due course, but, except a very brief outline indeed, it is much too important a one to be described in "Shop." I confess I never made a thermometer myself, and unless it should be my lot to be cast upon a desert island, I do not think I shall ever try.

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At the present moment I have before me a very well made and accurate instrument of this sort, which registers the lowest degree of temperature reached during any given time, besides indicating the temperature of the surrounding air at the moment of inspection. For this thermometer I paid one shilling, therefore, to my mind, it is waste of time to attempt to make one. However, as you ask, and—from your query—seem determined to "have a try," I give you the substance of the best description I can lay hands on at present. Obtain a fine glass tube blown into a bulb at one end; heat the bulb, which will cause the air to expand, and then place the tube in a vessel of mercury, which, as the air cools, will rush in and take its place. It should be so managed that the mercury may stand at a convenient height in the tube at the common temperature. Heat is now applied to the mercury until the column rises to the top of the tube, which is then sealed by heating the glass to redness and closing. As the mercury cools, it falls in the tube, leaving a vacuum. The instrument is now complete as far as construction is concerned, but the great point to be gained is to provide the means of observing what it is doing. To accomplish this, the first step is to ascertain the exact height to which the mercury rises when heated to the temperature of boiling water. The next to observe its position at the freezing point of water. These points being determined and marked, either upon the tube itself or upon a piece of metal or wood, to which it is attached, the intervening space is to be graduated. In this country Fahrenheit's scale is recognised as the standard, in which the interval between the freezing and boiling points is divided into 180 equal parts, or degrees. The freezing point is numbered 32°. Boiling point is therefore 212°. Below the freezing point the degrees are carried to 0, which is called Zero; above the boiling point, they may be carried to any desired height within the limits of the particular instrument.—OPIFEX.

Silvering Glass for Fretwork.—GLASS.—I am pleased to give you instructions for silvering glass, as I know all amateurs like to do as much of an article as they can, but whether you will be able to produce looking-glasses for your frames *cheaper* than you can buy I very much question, taking failures and other things into consideration; however, here are two methods:—Procure a piece of glass the size required, and if it is large, see that it is a nice thick piece, and free from blemishes; cut a piece of tinfoil a little larger all round than the glass, lay upon a level board or table, and smooth out the tinfoil (a roller squeegee, such as is used in photography, answers admirably); pour mercury (quicksilver) over the foil until every part is covered. And now comes the question: What glass are you using, plate or crown? as the subsequent operations vary accordingly. You ask for directions for plate-glass, so we will proceed with that idea. Take your piece of plate-glass, which must be perfectly clean, as the slightest dirt or speck shows very plainly when silvered, and commencing at one end, slide the glass along the tinfoil, pushing out a great deal of the mercury, and taking all air-bubbles and dirt with it; when this is satisfactorily completed, weight the glass as much as possible, so as to force out as much of the mercury as you can, tilting the board or table-helps: let it remain under pressure for, say, a whole night, then tilt one end up, and allow it to remain a day or two longer, laying a piece of foil under the lowest end to draw off all the mercury. Supposing, however, you use a cheaper kind of glass, like crown, or for very small ones window-glass. When you have cut the foil and covered it with mercury, lay a piece of clean paper on the mercury, and the glass upon that; then take hold of the paper with one hand, and hold the glass firm with the other, and by a quick motion draw the paper from underneath; put pressure upon it, and let it lay as with the other glass, only remember it will not bear a heavy weight like plate-glass. There is another method used for common glasses. I give it so that you may try it if you wish; but I think you will like the tinfoil best. Get some nitrate of silver and some ammonia; add the silver gradually until a brown precipitate commences; now filter. Take a piece of glass, wash with water, lay on a table, and rub with a pad wetted with a solution of Rochelle salts (1 in 200 of water). Now take the silver solution, and for every 20 parts of silver add 16 parts of a solution of Rochelle salts; it will soon become turbid, when it must be poured all over the glass. Place in a temperature of about 70°. When sufficient silver has been deposited—which will be in about half an hour—pour off the rest of the solution, wash four or five times, and set up to dry. When dry, it is advisable to varnish the back.—W. E. D.

Glass Painting.—GLASS PAINTER.—We can give no opinion concerning the firm you mention. You should endeavour to get the ear of some disinterested person who has been a pupil under similar conditions to your own.

Fire-Pump.—J. R. (*Helmshore*).—If the two pipes you speak of are coupled together as shown in your sketch, it would check the flow of water to a considerable extent. You must get a flanged tapering piece to run from 4 in. to 2 in.; this will improve the working.—R. A.

Cardboard Models.—G. FOLLENFANT writes:—"With reference to the paragraph in WORK, No. 96, p. 718, my correct address is G. Follenfant, 279, Cable Street, St. George's East, London, E. (near Shadwell Railway Station)."

Metal for Toys.—T. T. (*Birmingham*).—I cannot give you a receipt for any metal that will leave the moulds better than the ordinary alloys of tin and lead. I used at one time to cast my own kettle-knobs in brass moulds, and I never had them stick. You say you have blackleaded them, but to no purpose. Try them again by dipping them in the following solution:—Corrosive sublimate 1 oz., vinegar 1 pint; dissolve the corrosive sublimate in the vinegar (it will take some time to dissolve), then rinse the moulds through this solution and then well blacklead them; repeat the process, and I think you will find then that they will last for a long time without wanting to be done again, and that the metal will come out easily. Are you sure your moulds are not undercut anywhere?—R. A.

Banjo.—T. W. (*Hull*).—Your hoop being only 9 in. in diameter, let the bridge stand about 2½ in. from the extreme edge of hoop. Instructions for fretting a banjo have already been given, which, no doubt, you will have seen before this appears.—J. G. W.

Cases for WORK Volumes.—R. L. (*Edinburgh*).—These can be had of any bookseller, price 1s. 3d.

Tool Rack.—L. S. D. (*Brighton*).—First, as to the case. It must not be of a very great depth from the wall. By fixing the bottom board on the slope, instead of horizontally, odds and ends, such as pivots, rings, etc., could be stored therein without a possibility of falling out. Top board could conveniently be similarly treated. To prevent "interference" with tools, have one or two doors, a flap, or a sliding shutter or

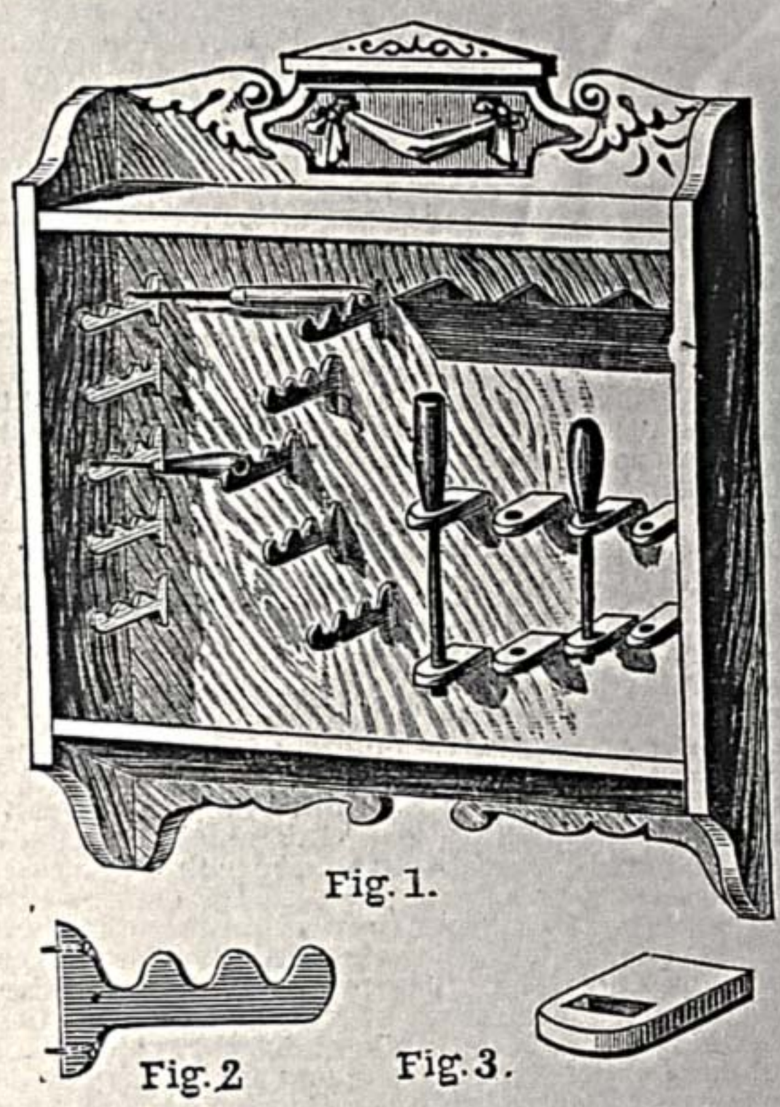

Fig. 1.

Fig. 2

Fig. 3.

Fig. 1.—Tool Rack. Fig. 2.—Left-hand Side Supporter. Fig. 3.—Right-hand Side Supporter.

board. Fit case solely with supporters shown at the left-hand side of the article. Chisels and gouges could then be laid in or taken out very easily. A side view of one supporter is delineated in Fig. 2. It will be advisable to have a long slanting board with an end and divisions, to form compartments for nails, screws, etc., at the right-hand upper half of the case.—J. S.

Tires to Bicycles.—H. R. W. (*Derby*).—I have to thank H.R.W. for informing me that I do not know how to put on a tire. It is about eleven years since I first began to fix on rubber tires on bicycle wheels. I have put on a good many up to now, and have the satisfaction of knowing that they are put on to stay. Strangely enough, the method your correspondent describes is the one I constantly use. When putting tires on old wheels for a newly-enamelled wheel, it is not allowable to have the cement ooze out by reheating, as it cannot be cleaned off neatly. My method to make a clean job is to revolve the rim, and heat up with a hot rod the bare rim; then to pour in the cement from a spouted ladle, evenly; then with the rod, only hot enough to spread the cement in the hollow without letting it come up over the edges. This done, I place the tire on as quickly as possible, stretching it the required amount, if any, and pressing it into the rim. This, if properly done, will be found to hold well, and requires no reheating with gas, which always, more or less, destroys the enamel, and no cement oozes out to be scraped off. With old wheels it does not matter how you go about it, provided you make them stick.—A. S. P.

Soldering for Goldsmiths.—TINKER asks for a chapter on the way goldsmiths solder their work. I will bear it in mind, and if it ever gets written he will find that there is not much difference in the actual soldering and the method he knows of brazing. The same flux, the same cleanliness, the same smokeless heat, are required, only more so. The differences are in the means taken to temporarily fix the work in position by means of loam, binding wire, gum dragon, etc. The heat also will have to be applied in various ways, and with regard to the different extent to which the various alloys expand, contract, and melt, as well as the thickness of the work. The ordinary blowpipe is used, and for large work one that is attached to bellows. Upon your suggestion I will make notes of the alterations in procedure in the different jobs as they arise at the shop. I have now something else in hand, and to write a companion chapter to Mr. Alexander's is impossible to me without a fair amount of consideration. Still, I thank you for writing as you have, for by letters such as yours one gets to know the subject more wished for. In the meanwhile, any particular thing you want to know I will try and answer. Do not try to solder anything without you are sure that the solder is of a suitable quality. It is with regard to the alloys of gold and of solder that such a paper will chiefly deal, I expect—not of the materials, for they are simple enough.—H. S. G.

Tool.—W. J. B. (*Bermondsey*).—Your sketch is altogether too rough for me to say positively what it is, but from your description it seems to be an arrangement for working a circular saw and drill from a lathe. As you know that the one you have was got at Bucks, why not call and ask them what the appliance is called?—D. D.

Picture Glass.—M. E. M. (*Heywood*).—Picture glass is superior to common window glass, which is only used for show-card purposes; quality of glass depends upon class of work it is for.—G. R.

Mitre Machine.—G. R. D. (*Shipley*).—Messrs. Powis, Bale & Co.'s address is Appold Street, Finsbury.

Lantern.—PATIENCE asks several questions in reference to the lantern he has, and one he proposes making. From description given, the condenser is a 3½ in. compound, though, if the sketch is correct, I can hardly make it out. Either of the sets of front lenses which he mentions I should judge will be suitable. As he says he can get a "good 15-feet picture" with it, I think the result with such a size condenser is all that could be expected. The only way to make the picture more brilliant with the present lantern is to procure a better lamp. The principal difficulty in the case of PATIENCE is that his first lenses are of such short focus, that he is compelled to come too near to the screen to be pleasant. His proposal to cut his 4 in. front in two and connect them by a sliding tube so as to separate the lenses further to procure a longer focus is not at all feasible. I do not think he can adopt his present lenses. What I recommend is to procure a new front lens, stating to the optician what he requires. He further asks, "Will the same arrangement"—dividing the front, I presume—"answer in the camera for photographing a building when not able to get far enough away to get the whole of building in plate desired?" I should say, certainly not. To photograph buildings under such circumstances a special front is made, and such are advertised in most catalogues. As to the possibility of a lime jet being dangerous to the condenser, there is not much fear of that if the lantern is properly ventilated. Although the lime jet is intensely hot, yet it is but a comparative point, and cannot radiate nearly so much heat as a three or four wick lamp. Something, of course, depends on the length of focus in condenser; the shorter the focus, the nearer the light must be brought to it, consequently, the larger the amount of heat that falls upon it. See that the cell containing the condensers has a hole in it. The other condenser described is not of any use for lantern purposes, though it would be of service for an enlarging lantern.—O. B.

Engine Slack.—FITTER.—Your data are vague, as the evaporative value of engine slack varies considerably, and so does the efficiency of Lancashire boilers. However, I can make certain assumptions and show you the *method* of working out the question. I suppose the pressure, 60 lbs., is gauge pressure (above the atmosphere). We must find the quantity of steam discharged in twelve hours, and the quantity of water which must be evaporated to produce that amount of steam. Water evaporated at 60 lbs. pressure makes 381 times its volume of steam (see Tables of Steam in any Pocket Book), therefore the density of the steam compared with water is $\frac{1}{381}$. The area of a pipe ¾ in. diameter is $\frac{11}{10000}$ of a square foot.—RULE. To find quantity of steam discharged per minute in cubic feet, divide pressure in lbs. per square inch by density of steam compared with water; multiply the square root of the quotient by area of outlet in square feet, and by 474. 60 lbs. pressure divided by $\frac{1}{381}$ is 60 multiplied by 381, which makes 22,860. The square root of this number is 151, and 151 multiplied by 474 makes 71,574, which, multiplied by 17 and divided by 10,000, gives 121⅝ cubic feet of steam per minute. This, multiplied by sixty minutes and twelve hours, gives 87,600 cubic feet of steam discharged in twelve hours. As one foot of water makes 381 feet of steam, 87,600 divided by 381 gives the quantity of water used 230 cubic feet; this, multiplied by 62½ lbs. (the weight of one cubic foot of water), gives 14,375 lbs. water evaporated in twelve hours. Divide this by the pounds of water evaporated by 1 lb. of fuel, and you have the consumption of fuel. Thus, if your slack will evaporate 6 lbs. water per pound of slack, the fuel consumed in evaporating 14,375 lbs. of water will be 2,396 lbs., or 1 ton 1 cwt. 1 qr. 14 lbs. You must know how much water 1 lb. of fuel will evaporate when burnt in your particular boiler to settle this question. I have assumed the pipe you blow off

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through to be short, and have not allowed for friction in it.—F. C.

Waste Moulding with Wax.—J. H. (*Bristol*).—Some remarks on wax for this purpose will be found in No. 91 (p. 685, Vol. II.). Of course the thin inner mould only will be of wax, and the outer one of plaster. The surface of the clay model needs to be drier than for plaster moulding. Its tendency to shrink makes wax a more difficult material to mould in than plaster, but if he has patience for a few trials, we trust that J. H. will accomplish it successfully.—M. M.

Work on Dynamo.—J. C. D. (*Southport*).—Apply to the author of the book:—A. Crofts, 7, Clarendon Place, Dover.

Polish Reviver.—A. T. (*Burnley*).—I cannot state exactly the cause of your failure, as many reasons might be given. Perhaps you have lumped all the ingredients in together, or the polish may have something in it other than shellac and spirit, and so cause it to curdle. The mixture is commonly used, and, with suitable materials, there is no difficulty in making it. I am afraid something must have been wrong with one or other of those you used. If you find you cannot succeed after these hints, try plain methylated spirit instead of polish, or, if you prefer it, a little glaze. Some polishers add a little butter of antimony, but I am not much in favour of it.—D. D.

Finishing Rosewood.—PUCK.—Rosewood being naturally a dark wood, if you want to make anything of a light colour, you will have to use some other material. At the same time, rosewood is not generally black, though some of the darker markings may practically be so. Like other kinds of wood, there are varieties in the colourings of different logs, and you might select the lightest you can come across. If, when polishing, the oil is found to darken the wood more than you like, all that is necessary is to omit the oiling. Use white polish on rosewood. Certainly methylated spirit is better than naphtha to make polish with, otherwise, it would not have been recommended. Naphtha may be used if you prefer it, but ordinarily there are strong objections to it. It was formerly employed to a great extent, but has now been almost, if not entirely, abandoned in favour of methylated spirit. I have never known of its being used—*i.e.*, it has never come within my personal experience, but I have heard old polishers speak very strongly against it. The smell alone is enough to prevent anyone using it if he can get something less unpleasant.—D. D.

Finishing Mahogany.—G. W. (*Blackburn*).—A good many hints have been given in "Shop." You cannot do better than read them. The wood being as smooth and well finished off as possible, if you desire to enrich or darken its colour, go over it with raw linseed oil, applied with a rag. Do not saturate the wood with the oil. After oiling, let the job stand for a time and then fill in the grain. There are many kinds of fillers, but I should recommend you to use one of whiting made into a thin paste with water, turpentine, or spirits, and tinted with rose-pink. Rub this mixture well into the wood and clean off any excess before it gets hard. When the wood is perfectly dry, body up with French polish, applied with a rubber, after having smoothed down any roughness with finest glass paper, if necessary. When bodying up, be careful not to use too much polish at a time on the rubber. The first coating will very probably be found to have sunk after a few hours, so repeat the operation as often as may be necessary, but be careful not to get too thick a coating of the shellac. The final operation is spiriting off by means of a rubber moistened with methylated spirit instead of with polish. The effect of this is to remove the hitherto dull and smeared appearance of the surface, and to produce the fine gloss which ought to characterise French polish. To get the best results is by no means easy. It is, in fact, almost impossible without some practice, so you will be wise not to make your first attempts on anything you value.—D. D.

Batteries for Electric Lighting.—F. E. G. (*Norwich*).—(1) The zinc plates in a single fluid chromic acid or bichromate of potash battery should be removed when the battery is not at work, to prevent waste of zinc. The powerful acids in this form of battery will undermine the coat of mercury, and attack the zinc beneath, if the plates are left in the solution. As you wish to leave the zincs in ready-charged cells, so as to only switch on the lamps when required, you must employ a double fluid bi-celled battery, such as the Fuller or the Granule types. In these the zincs are placed in the porous cells charged with dilute sulphuric acid, sulphate of zinc solution, or chloride of zinc solution, and the carbons only in the chromic acid or bichromate solution. As the internal resistance of these is greater than that of the single fluid battery, more cells must be employed to light up the lamps. (2) I do not know the "Edgware Battery," so cannot give you compared results. (3) The voltage and candle-power of a lamp may be guessed by noting the thickness and length of its carbon filament. A thick filament may have a low voltage, so also may a short filament, whilst long and thin ones have generally a high voltage. You may roughly determine the voltage by actual experiment with a bichromate battery. Estimate each cell as giving two volts, and add cells until the lamp gives out a white light. But the correct value can only be determined by a voltmeter and a photometer. (4) It is not necessary to make the battery box of pine, teak, or mahogany. These are most durable for the purpose, but the box may be made of any other kind of wood. (5) The cells of a Leclanché battery may be filled with solution, but the tops of the porous cells must stand above the solution to allow free escape of gases formed in working. The rule you quote from Gunot's "Physics," errs on the side of extreme efficiency. (6) No porous cell is used or required with the agglomerate form of the Leclanché. No apology needed. Always glad to assist correspondents with advice.—G. E. B.

Overmantel.—CAPUT NIGER.—If the proportions of this drawing are considered satisfactory, you will find that the dimensions given to accommodate it upon a 4 foot 6 in. mantelpiece will be an almost exactly proportionate enlargement, as I have drawn the sketch to scale. Height of room will have an influence upon its appearance. I have allowed sufficient space for your lustre-shades, which you say are 19 in. high. My notes to IMPROVER (Vol. II., No. 80, page 457) will apply in some respects to the construction of the framework of the present overmantel. Top column blocks could run up through clear mortices in moulded top shelf, the parts showing above said shelf being in an entirety with those

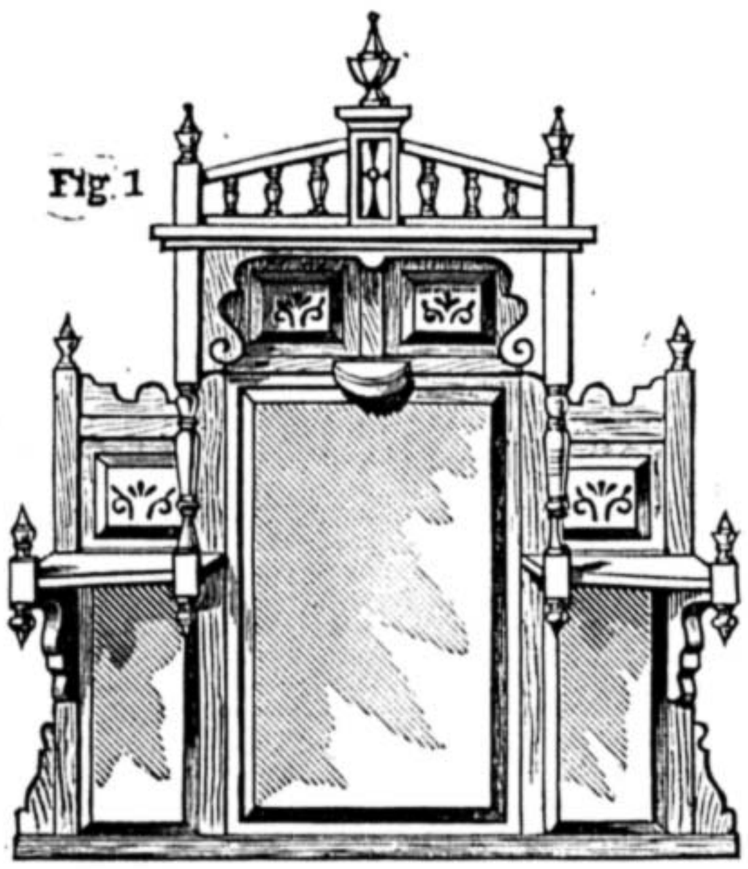
Fig. 1

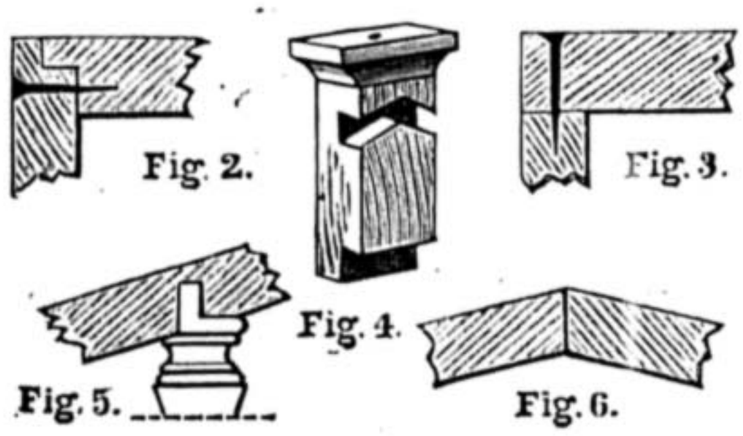

Fig. 1.—Overmantel. Figs. 2 and 3.—Methods of screwing Canopy Shelf to Framework. Fig. 4.—Back View of Top Block. Fig. 5.—How to join Spindles. Fig. 6.—Union of Top Spindle-Rails.

below it respectively. This shelf might be screwed to framework, either as shown in Fig. 2 or as in Fig. 3, shaping it at back corners to permit it to fit round framing properly. Extreme top spindle-rails would be joined to side blocks by morticing and tenoning; while to middle block they would be united by shaping block as in Fig. 4 (back view). Lower rail in connection with these spindles would be similarly treated at side blocks, and would run through middle block. This would bring face of middle block flush with extreme front of moulding on top shelf. Fix spindles as in Fig. 5. Return the spindle gallery in a straight manner at sides, the longer rails of back framework being carried above remainder to allow this to be done. Dowelling or screwing the pillar blocks will answer. Height to top of top shelf, 4 ft. 4 in.; height to top of side rails, 34 in.; height to top of side shelves, 25 in.; height to top of top block, 5 ft.

Coach-Building Books.—YOUNG WHEELER.—I am not aware of any books being in print upon Coach Building or Wheeling. The information found in monthly papers devoted to the trade contains only essays upon the subject, which, if you have a little knowledge of coach building and wheeling, would, I have no doubt, be found to be very useful to you. Follow "Shop" pages for much on this subject.—W. P.

Lamp Design.—TAH (*Whitstable*).—A lamp such as you describe, if fixed a distance of 3 ft. or 3½ ft. from the glass, would concentrate its rays on only a small portion of the window, leaving the rest in darkness. If this is really what you require, I shall be pleased to assist you in constructing it, if you will send dimensions.—J. W.

Camera Articles.—CAMERA.—An article on the above appeared in WORK, No. 13, and can be had from the publishers, post free, for 1½d.

Polish.—W. E. (*Heckmondwike*).—Your letter is interesting, as indicating a possible improvement in the method of French polishing, but I am sorry to say that very few of the discoveries which are brought out from time to time are of any practical value. I do not say this to discourage you, but I must confess that it is difficult to realise that a French polished surface of the best quality can be got by using anything which does its own spiriting off. If I understand you rightly, the bodying-up and spiriting off are done in one operation, or, to put it in other words, that by your medium being used spiriting off afterwards is unnecessary. If you can really get a fine polish up without spiriting off, which is such a troublesome operation with beginners, your invention will be a boon to amateurs at least, and I fancy many professional polishers would be glad to hear of your mixture. In the interest of these and others, there can be no objection to testing the tin which you suggest sending. I would also suggest that you send with it a small piece of wood, which you could enclose in an ordinary letter, in order that an opinion of its appearance may be formed, as it is assumed that, as with every new material, the best results are not got without some practice. This you have doubtless had. You might also say, as you do not know whether work done by your method will stand, how long it is since you discovered the process.—D. D.

Hand Beader.—R. H. W. (*Lewisham*).—The action of the irons is rather of a scraping than a cutting kind. If you begin with moderate pressure the beads should not require much, if any, papering to smooth them. They certainly should not be torn and chipped out; if you get them so, the fault is either in the tool or in your manipulation of it. It is hardly likely to be the former, and I think your best plan would be to get someone to show you how to use it. If you cannot do this, just imagine the tool to be a cutting gauge, and work it as you would this tool, not attempting to form the beads at the first stroke. With a little attention you should soon get over the difficulties which you are sure to find with a new tool. The proper slope at which to fix a cutting-board for inlaying purposes depends entirely on the thickness of saws and wood. All you want a slope for is to enable you to saw upright, making sufficient allowance for the saw-kerf.—D. D.

Leather.—A. F. W. (*Oldham*).—I do not know of any use to which you could put a large quantity of leather such as the sample you enclose, and I am equally unable to tell you of a market for it. Suppose you were to try a dealer in old clothes or a marine store dealer. I understand they will buy any rubbish if it is only cheap enough.—D. D.

Fret Tower.—J. W. McG. (*Manchester*).—I am afraid the breakage of the tenon (A) in your design when put in the mortice (B) can only be attributed to want of skill or clumsy handling. Possibly there may have been a flaw in the wood, but I am inclined to think that you must have had the grain running across the tenon instead of the reverse way. Of course, in that case you could not expect the tenon to stand, but otherwise it ought to have been strong enough to hold with fair usage. Now that you have broken the tenons off, your best plan will be to fasten the pieces together with smaller strips or blocks of wood, glued along inside the inner angles. Unless they are too big, they will not be visible from the outside. Even with the tenons it would have tended to stiffen the joints by using blocks. Glue may also be used along the edges, as well as small wire nails and needle points. You ask for the best way how to proceed with your work, but as you do not name any difficulties but the one referred to above, I am afraid I cannot help you further at present.—D. D.

Fret Monogram.—T. W. A. (*East Dulwich*).—You will find no difficulty in making a monogram if you trace each letter on a piece of ordinary tracing-paper. If you want fancy letters for fret-cutting, you might find those published by Messrs. H. Zilles & Co., Wilson Street, Finsbury, E.C., of use to you.—D. D.

Upholsterer.—YOUNGSTER.—There is no way of treating hair seating so that seats covered with it can be buttoned deep, as in morocco. All you can do is to slightly indent or tuft. Without saying that it cannot be done at all, it is impossible to do what you want satisfactorily. All in good time for the other subject; everything cannot be given at once.—D. D.

Terra-Cotta Cleaning.—HUNTSMAN.—To clean your terra-cotta plaque, make a fairly thick mixture of starch and water. Cover the place with this. When the starch dries it will crack, and be easily removable. The dirt will have been removed along with it.—D. D.

Patterns on Plush.—H. K. (*Stamford Hill*).—The dotted appearance of the designs is owing to their having been transferred by pouncing through a perforated design. There is a machine for perforating the designs, but it is a costly affair, and the usual plan is to prick the holes through the paper with a pin, or something similar.—D. D.

Bell Telephone.—DISTANCEPHONE.—The patents for above have expired, and you can now buy and use them at pleasure. You will get them at any electrical store. They are being very much advertised at present. You should always send name and address with your queries.—W. D.

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III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Horse Hair.—G. J. W. (*Ballymena*) will be much obliged to any reader who will name any firm of whom he could purchase a small quantity of hair cloth for chair covers.

Cardboard.—HECTOR will be obliged for any instructions for making a machine for cutting cardboard.

Firewood Wire.—J. R. (*Belfast*) writes:—"Would a reader kindly describe how the resin-dipped firewood, sold in London, is tied by wire? Are the wire ties better than cord or twine? Who sells the wire, and the price?"

Watch Parts Stamping Machine.—NO FAD writes:—"What kind and weight of press is used to cut the largest plates in watches? A few lines will do for me, as I am somewhat accustomed to the machine shop."

Transfer Pictures.—W. H. F. (*Glasgow*) writes:—"Will any of our kind readers give me the name and address where I could obtain some good transfer coloured pictures for transferring on wood, china, etc. etc.?"

Tin Labels.—LABEL writes:—"Will any reader inform me where I could obtain circular pieces of tin or zinc stamped with holes at the top and bottom for stitches in sewing the labels on sacks? The labels to be had at Berwick-on-Tweed have to be hand-cut and hand-stamped, and their appearance is far from being neat, besides being probably more expensive than if they were cut and stamped with a press. The name of a firm likely to supply the above would oblige."

Sharpening Scissors, etc.—H. F. (*Ramsbottom*) writes:—"Will any of our readers kindly describe the best mode of sharpening scissors, etc.? Or, if there is any special machinery, I should be glad to know the maker's name of same."

Paper Pulp.—W. S. (*Highbury*) writes:—"Can anyone oblige by telling me how to turn paper into pulp, and how to turn the pulp into papier-mâché articles, etc.?"

Iron Lasts.—W. S. (*Highbury*) writes:—"Can anyone give address of iron last sellers (in London), and how bought, if by weight or pair?"

Catgut.—A WORKONIAN will be thankful to be informed *how clock gut* is made, with all the various processes it has to go through—such as bleaching and twisting.

Draw-Knife.—W. W. M. (*Glasgow*) writes:—"I would be very much obliged to any reader who could let me know through 'Shop' where I could purchase an instrument called 'Perkin's draw-knife and chamfer gauge,' and if possible, the price."

Milk-Float.—CYMRO will be obliged to any correspondent who will give him a design for a milk-float to suit a large pony or small horse.

Oil-Paper.—W. K. (*Congleton*) will be very glad of a recipe for making oil-paper for packing blacking in.

Indiarubber Type.—'09 writes:—"Will any reader inform me through 'Shop' how to fix india-rubber type (without metal) on a silk ribbon, or give me the address of any firm to whom I could apply?"

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Dynamo.—G. E. B. (*Lewisham, S.E.*) writes:—"If F. S. (*Normanton*) reads carefully the articles on 'Model Electric Lights,' in Nos. 92, 94, 97, 99, Vol. II. of WORK, I think he will learn how to make a small dynamo. He should have stated the candle-power of the lights desired, and also the horse-power of the motor he has made."

Electricity Classes.—G. E. B. (*Lewisham, S.E.*) writes:—"Write to the secretary of the City and Guilds of London Institute, and ask his advice, at the same time stating that you are an apprentice and cannot afford a high fee."

Window Cleaning.—G. E. B. (*Lewisham, S.E.*) writes:—"Either CHEMICAL or the printer has made a mistake in recommending hydrochloric acid for window cleaning on page 766. The properties ascribed by CHEMICAL to hydrochloric acid are precisely those possessed by hydrofluoric acid. I should hesitate to recommend either acid for the purpose, because of their injurious effect on finger-nails."

Band-Saw Machine.—M. (*Bishop Auckland*) writes, in reply to J. H. (*Sheffield*) (see page 765, Vol. II.):—"You can get a foot-power band-sawing machine from Chas. Churchill & Co., 21, Cross Street, Finsbury, E.C. I believe the price is about £8, but you had better write for particulars."

Joiners' Bits.—A. R. (*Scorrier*) writes, in reply to A. A. W. (*Leicester*) (see page 734, Vol. II.):—"The following will be the names of joiners' bits:—(1) Centre-bit; useful for boring large or small holes. (2) Countersink-bit, of which there are three kinds: there are the rose-head, the snail-horn, and the flat-head. These bits are used for reaming the entrance of holes, so that the head of screw may be below the surface of the wood. (3) Taper-bit, for boring funnel-shaped holes. (4) Sash-bit. (5) Nose-bit. (6) Shell-bit, used for boring small holes for pins, nails, etc. (7) Spoon-bit; useful for boring holes in the end grain. (8) Bobbin-bit, for boring bobbins. (9) Gimlet-bit. (10) Dowling-bit. And there is a half-round; also the square rinder for reaming the holes, should they be required a little larger. I am not acquainted with bits by the name you mention."

Preparation for Blackboards.—A. R. (*Scorrier*) writes, in reply to A. J. L. (*Paddington*) (see page 718, Vol. II.):—"The following receipts will answer your purpose:—(1) To make two quarts of paint for blackboard, take 5 oz. of pulverised and sifted pumice, 3 oz. powdered rotten-stone, ½ lb. of good lampblack, mix with alcohol, to form a thick paste; rub all, or rather grind all, together, then in the remainder of the two quarts of alcohol dissolve 7 oz. of shellac by agitation, after which mix with this the paste. Apply to the board with brush, not forgetting to well stir the paint, the first coat to be well dried before the second is put on. (2) Lampblack and flour of emery mixed with spirit varnish, the thinner the mixture the better; the lampblack should be first ground with a small quantity of alcohol to free it from limps; apply with a paint brush. (3) Wash for blackboard: four pints 95 per cent. alcohol, 8 oz. shellac, 12 dr. lampblack, 20 dr. ultramarine blue, 4 oz. powdered rotten-stone, and 6 oz. powdered pumice. To apply the above the surface must be smooth and free from grease; shake the bottle well, pour into a pot or dish; and apply with a flat brush as quickly as possible; be sure to keep the bottle well corked, and well shake it each time before using it."

Illuminating.—C. P. W. (*London, E.*) writes to GILT (see page 601, Vol. II.):—"Why does GILT use gold leaf at all, when at best it is a somewhat tedious and messy process in the hands of an amateur? I always use the ordinary gold paint, which is sold in mussel-shells and saucers. This keeps its colour, and is susceptible of taking a good surface by burnishing, which is done by placing a piece of highly glazed writing-paper over the portion to be operated upon, and well rubbing it with an agate burnisher. Should GILT, however, still prefer the gold-leaf method, water gold size for the purpose can be procured of Messrs. Barnard and Co., Oxford Street, or Messrs. G. Rowney & Co., Rathbone Place, W., where he could obtain also the agate burnisher."

Cardboard Models.—A. M. (*Glasgow*) writes, in answer to J. F. (*Mullingar*):—"If you write to Messrs. Crosby Lockwood & Co., for 'The Art of Architectural Modelling in Paper,' by T. A. Richardson, you will get many hints as to model making. It deals principally with model houses, but no doubt the instructions could be followed out in other articles. The book is one of Weale's Technical Series, and its price is, I believe, about 1s. 6d."

Brick and Marble Tesseræ.—M. (*Bishop Auckland*) writes, in reply to R. E. (*Kensington*) (see page 669, Vol. II.):—"Try Cappello & Co., 32, Euston Square; Dispoker & Co., 40, Holborn Viaduct; W. B. Simpson & Sons, 100, St. Martin's Lane, W.C., London; or James Nelson, Junction Street, Carlisle."

Band and Circular Sawing Prices.—A. R. (*Scorrier*) writes, in reply to E. E. W. (*Bushey*) (see page 650, Vol. II.):—"You want to know how to charge for work done by the above for wheelwrights, builders, etc. Felloes are charged at 3s. 6d. upward per dozen, shafts from 4s. 6d. per pair, trap wings from 1s. 9d. per pair; brackets, etc., that require extra labour and time, the timber often is charged, then the time taken in sawing charged, or so much each. Circular sawing at the rate of 2s. 6d. per 100 ft. for soft wood; hard wood about double that of soft wood. Staves at so much per mill; a mill measures 10 ft. long and 40 staves high."

Rabbit Skins.—W. H. M. (*Preston*) writes, in reply to IDEM SONANTIA (see page 634, Vol. II.):—"You can cure rabbit skins in the following manner:—The skins should be quite fresh. Remove all 'meat,' fat, etc., and stretch on a board with tacks or pins fur side down. Wash over with strong solution of alum dissolved in hot water, rubbing it into the skin with a piece of rag or sponge tied on the end of a stick. This should be done twice a day for, say, four days, and then the skin should be dried thoroughly in a warm place, as before a fire. Next remove from the board, and rub between the knuckles of both hands and round the handle of a drawer or through a smooth ring, and the skin will become soft and pliable. The fur on rabbit skins is in best condition in winter time."

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—BLOCKHEAD; MECHANIC; W. G. (*Edinburgh*); BOVRIL; E. H. (*Bethnal Green*); T. H. C. (*Manchester*); FACTS ON; JEWELLER; REX; W. E. D. (*King's Lynn*); G. B. (*London, N.W.*); CHICKS; C. M. (*Perth*); S. H. (*Walsall*); F. G. B.; J. P. (*Bethnal Green*); H. C. (*Norwich*); F. G. (*Leicester*); W. G. (*Erith*); ONE WHO GETS GOOD TIPS FROM "WORK"; A CONSTANT READER OF "WORK"; F. C. R. (*Liverpool*); NERO; W. G. (*Southport*); HAMMER AND DRIVER; TEAK; COCKER; ELEVEN; G. B. (*Dublin*); DUBLINIENSIS; J. W. H. S. (*Sheffield*); C. W. B. (*Plymouth*); GALA; KENT COAST; H. C. (*Lee, S.E.*); L. K. (*London, S.E.*); P. B. C. & Co. (*London, S.E.*); H. W. (*Notting Hill*); A WEEKLY READER; H. M. W. (*Blackpool*); A. P. S. (*Heaton*); A. E. S. (*Glasgow*); H. F. M. (*Manchester*); W. J. (*Cardiff*); J. J. A. (*Wandsworth*); L. C. (*London*); H. H. (*Cambridge*); NOVICE; A. R. T. (*Tottenham*); J. (*Portsmouth*); A YOUNG WORKMAN IN TROUBLE; G. A. (*Liverpool*); G. P. (*Elgin*); J. G. (*Aberdeen*); A. J. K. (*Sheerness*); J. M. (*Manchester*); S. M. (*Camden Town*); A. R. (*Scorrier Saw Mills*); W. D. H. (*Edinburgh*); W. J. W. (*Leytonstone*); W. H. W. (*Dublin*); VOLTAGE; W. S. (*Rugby*); H. E. (*London, N.W.*); G. A. R. (*Kennington*); K. M. (*Partick*); ANXIOUS; H. F.; T. H. F. (*Cornwall*); J. N. B. (*Liverpool*); TRICHORD; R. E. F. (*Chinnford*); A. G. F. (*High Wycombe*); ANTONIO; J. B. (*Lancashire*) ORGAN BUILDER; CARO; COMPO; G. F. (*Sunderland*); J. W. B. (*Huddersfield*); F. S. (*London, W.*); A. V. H. D. (*Holloway, N.*)

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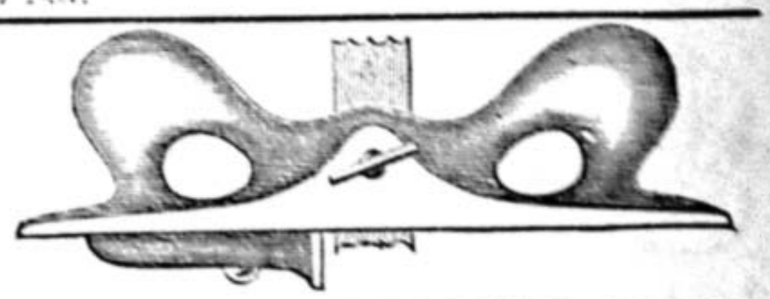

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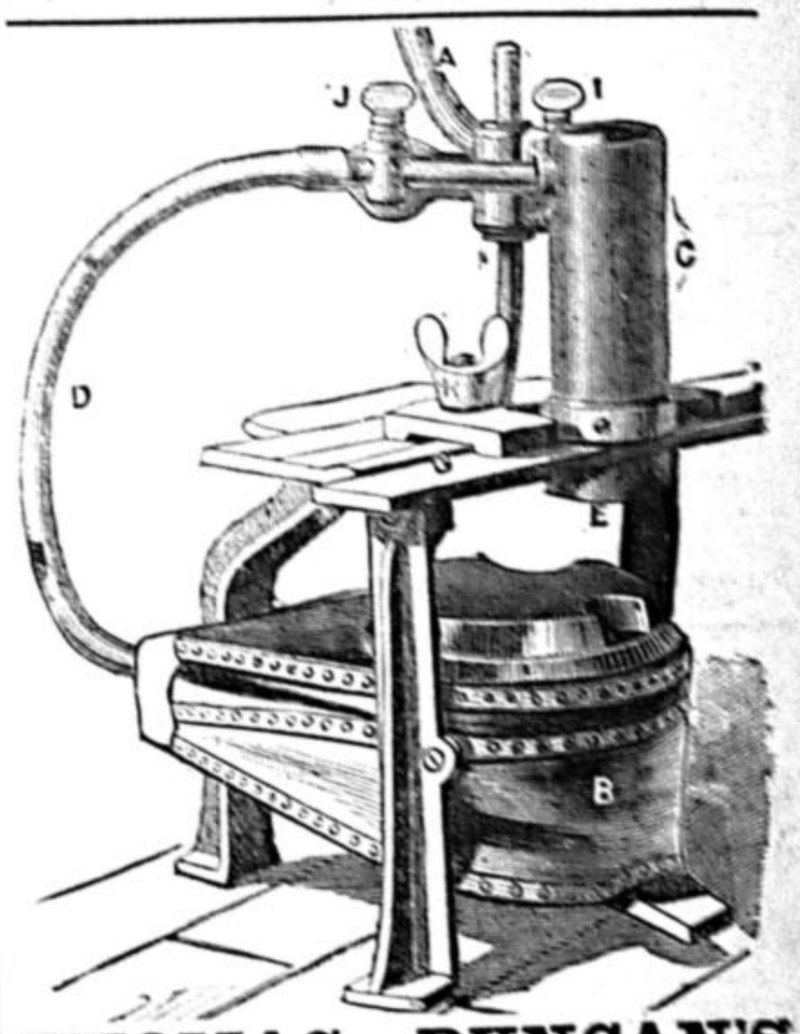

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